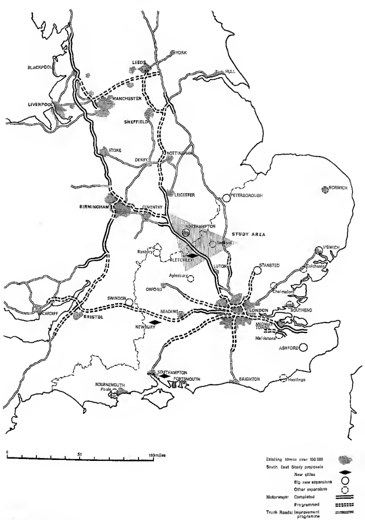

Diagram 1 Location of the study area.

Ministry of Housing and Local Government

Northampton, Bedford and North Bucks study

An assessment of inter-related growth

London Her Mejesty's Stationery Office 1965

Foreword

This report on the inter-relationship of possible development in the areas of Northampton, Bedford and Bletchley has its origin in the South East Study which set out the need to make adequate provision for the growing population of the South East.

Decisions had already been taken in principle on the expansion of Northampton and the building of a new town in North Buckinghamshire before the report had been completed. The Ministry are not committed to the details of these projects nor to the other recommendations put forward by the Consultants, but think it is useful to publish the report at this stage as a working document for the consideration of the local authorities and others interested in the proposals.

Ministry of Housing and Local Government

October 1965

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Ministry of Transport
Ministry of Labour
British Rail
and with the local authorities of the area.

The consultants wish to express their thanks to all those who have helped with advice and information.

Chapter 1: Introduction and Summary

1. This report is the result of a study into expansion in the Bletchley, Northampton, Bedford area based on the following terms of reference:

> 'The South East Study suggests a new town of 150,000 people in the Bletchley area, a planned increase of 100,000 in the population of Northampton and of at least 30,000 in that of Bedford. No time scale is proposed for the achievement of these totals, but possible progress by 1981 was estimated to be: Bletchley, 75,000; Northampton, 50,000; and Bedford, 30,000. Including natural increase of the existing towns this gives an overall growth of 174,000, resulting in a total population by 1981 for the three towns of 359,000. Further growth at a similar rate is likely after 1981.
>
> 'The main considerations leading to these proposals were:
>
> (a) large existing commercial centres likely to be able to attract and to provide the necessary facilities for *offices* on a considerable scale as soon as possible; and
> (b) areas with a potentiel for growth of existing industry—in order to minimise the amount of new industry which would need to be moved to support population growth;
> (c) areas able to provide for the requirements of large industrial units;
> (d) concentration of effort to make the most efficient use of manpower and resources in planning and implementing the S.E. proposals.
>
> 'These considerations have a bearing on the suitable pattern of population distribution for this area, and on the relationships between the three towns.
>
> 'You are required to study, report and make recommendations on:
>
> (a) the inter-relationships of developments of this order within the area roughly within 15 miles of any one of these three towns;
> (b) the merits and demerits of a closer and more integrated grouping of the planned developments;
> (c) the possible site or sites for closer development;
> (d) the problems of providing an adequate system of transport end communication ellowing free movement between the separate parts of the development.'

2. The study area is located midway between London and Birmingham and is traversed by national road and rail communication routes. It is within easy travelling distance of a wide range of facilities, a geographical advantage which could prove of prime importance in its development.

In the four months available for this report an attempt has been made to examine potential growth patterns in the area. A general study has been made of the population and employment structure of Northampton, Bedford and Bletchley, together with the shopping, recreational and community facilities in the towns. The existing communications systems have been considered, and various nonurban land uses in the study area have been examined. The development proposals initiated by local authorities in the area have also been taken into account.

3. Following these studies an assessment has been made of the expansion potential of the towns and the desirability of carrying out such a programme as compared with alternative groupings of development.

4. Finally, a critical examination has been made of the assumption in the brief and in the South East Study concerning population increase; proposals are put forward for the formation of a research group to consider the effect of future growth on a large scale, and various principles are suggested for more flexible forms of town development. Theoretical studies with various types of movement —pedestrian, motor car and public transport—have been undertaken to illustrate these principles.

5. The following is a brief summary of the main conclusions:

(a) Northampton is a suitable town for major expansion; there should be no difficulty in increasing the population by about 50,000 by 1981, rising to about 100,000 by the end of the century. Sites are suggested to the south-east and south-west of the town for the major part of this expansion; the precise extent of this increase should depend on further detailed study, and the preparation of planning proposals, for the whole town area. These proposals should involve the replanning of the central area and the dispersal of employment areas to allow an adequate transport system to be provided.

(b) Bedford is a prosperous town with a rapid rate of growth, making it a good location for further expansion. There should be no problem in increasing the population by 30,000 by 1981 as envisaged in the South East Study but it is considered that an expansion of at least 70,000 should be planned. A site to the west of the town is proposed. The redevelopment proposals for its central area should be reconsidered on the basis of this scale of expansion, and a comprehensive plan for communications will be required

(c) There are two possible sites for the development of a new city of about 200,000 population in the area: one just north of Wolverton is more interesting topographically but is too close to Northampton, the other about 3 miles north of Bletchley is better related to the existing pattern of towns. The Bletchley site is recommended.

(d) There is merit in a scheme which combines the advantages of town expansion in the early stages with those of a new city in the later stages.

(e) Any acceptance of finite town expansion and a finite new city could lead to very considerable difficulties in the future if population growth continues at a high rate. The new developments should be planned on the basis of the maximum flexibility of design to ensure as far as possible that they will ultimately fit into whatever form of overall plan is evolved. Particular attention should be paid to the role of public transport in the large settlements proposed, its effect upon town form and its phasing with the development of the town.

(f) In the implementation of these proposals, consideration should be given to the advantages resulting from the setting up of Development Corporations, working in conjunction with the local authorities and also to the planning of towns and expansions in advance of designation of the sites.

Chapter 2: Survey

Survey

1. The study area (diagram 1) is located midway between London and Birmingham, and is traversed by national road and reil communication routes. It is within easy travelling distance of a wide range of facilities, a geographical advantage which could prove of prime importance in its development. It falls within three counties, Northamptonshire, Bedfordshire and Buckinghamshire, and the three main towns of Northampton, Bedford and Bletchley form a triangle with sides of 20 miles, 15 miles and 18 miles.

2. Topographically the area is undistinguished. The land is gently undulating and broken by many small rivers and streams which eventually collect into the Ouse and Nene, draining finally into the Wash. Owing to the flat nature of the land the larger rivers are subject to flooding, in some cases up to as much as $\frac{1}{4}$ mile on either side. The rivers run between a series of low NE/SW ridges which are the most dominant feature of the area. Mainly of greensand, the ridges have a more forested vegetation which is a pleasant relief in an area not over endowed with trees. The most important forested areas occur around Woburn, a complete strip along this ridge being reserved as an area of landscape value. A similar but smaller forested area runs between Olney and the M.1. The more important topographical features are illustrated in diagram 2.

Land use and natural resources

3. Apart from urban and agricultural uses there are other major land uses which are likely to influence the development of the area. The relatively flat nature of the land has resulted in the development of several airfields, the most important of which are at Cranfield, Thurleigh and Cardington. These large reserved areas are surrounded by the usual height restriction cones. The services and potential of the airfields are described in chapter two, paragraph 58, but it should be noted here that the reservation of the large areas of land obviously restricts the land available for large new developments. There are a number of other areas restricted to governmental activities but these offer fewer difficulties. The most important of these is the Diplomatic Wireless Station, sited to the north of Wolverton.

4. Mineral resources are importent (diagram 3). Clay is the raw material for one of the major industries of the area, brickmaking, and the bulk of the supplies are obtained from the area between Ridgemont and Bedford. Several important brickworks are established along the Oxford/Cambridge railway line and these have proven reserves for about a century. At present brickmaking is an important feature of the employment pattern. The clay reserves have a double effect on development since not only do they sterilise large tracts of land, but the smoke effluent produced in fletton brick manufacture is extremely unpleasant and tends to restrict development in surrounding areas, notably to the north-east. This is particularly relevant to the area south of Bedford, but there are also a number of smaller pits around the Bletchley area. To the south of the latter town is a group

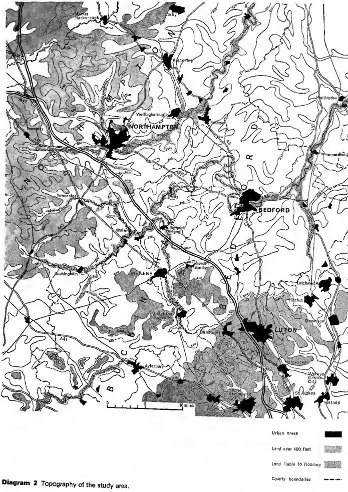


Diagram 2 Topography of the study area.

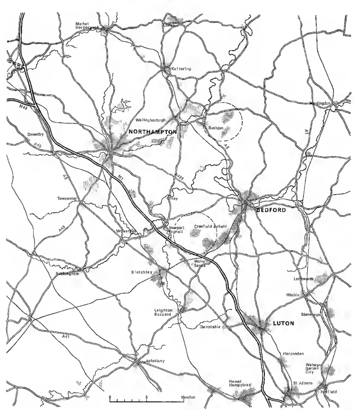


Diagram 3 Major roads and restrictive land uses in the study area.

of active pits, covering a fairly large area. Several other sites to the north have been zoned for extractive purposes, but as yet these are largely undeveloped.

5. To the north of the study area are considerable sites reserved for ironstone working. A large site with planning permission granted for extraction to the south of Northampton is likely to present the only serious difficulty. If this site is needed for development it is understood that it may be possible to overcome the difficulty either by preventing extraction or, if this proves to be impossible, by using the site at a later stage after extraction and rehabilitation have taken place.

6. Deposits of gravel occur along both river systems and there is a large number of active pits. Any developments in the area will increase the demand for gravel and it will thus become even more important that the deposits be protected from sterilisation by building development.

Population

7. The area is subject to the influence of two major population groups. By far the most important is the greater London metropolis, with a population of over 8 million, but the influence of Birmingham with 1,107,000 people is also felt, especially in the northern parts of the area. Leicester, Nottingham and Coventry also have some regional importance.

8. The settlement pattern in the surrounding area is similar to that of the study area itself, which therefore can be visualised as being part of a fairly regular network of settlements subjected to the influence of major cities to the south and north-west. A possible exception to this is Coventry with a population of 306,000, which is rapidly expanding and has a considerable influence on Northampton.

9. The study area had a population of approximately 470,000 in 1961 distributed among the towns and rural areas as indicated in diagram 4.

10. Northampton is the largest town in the study area. In 1961 the population was 105,000 as compared with 104,000 in 1951. This small increase does not give a true picture of population growth in the district owing to the effect of administrative boundaries on statistical presentation, as the suburbs and villages directly associated with the town had very heavy increases. In the same ten-year period Weston Favell increased in population from 1,800 to 5,100 and Duston from 2,700 to 4,900, both of these being contiguous with the Northampton built-up area. The increase for Northampton and its immediately associated areas was nearly 13,000 for the ten-year period. Half of this represents natural increase and half inward migration, the latter having increased considerably during the last four years.

11. From the age structure for the three main towns (table 1) it may be seen that Northampton has a relatively old population by comparison with the other towns, 40% of the population being over 45. This compares with its own rural area 35%, Bedford 30%, Bletchley 27% and with the national average of 37%. Northampton has a very much higher proportion in the 10–14 and 35–39 age groups, as compared with the other two towns.

12. A projection of the present male population of the three centres up to 1971 and 1981 shows the available male labour force in Northampton increasing less both relatively and in real numbers than in Bedford, and much less relatively than in Bletchley. Furthermore, though there will actually be a very sharp rise over the next ten years in the number of young male workers aged 15–24 looking for jobs in Northampton, their numbers will be offset by an overall decline amongst those aged 30–54, the years when experience is combined with energy; these disparate trends suggest a probable need to replenish the group of skilled workers.

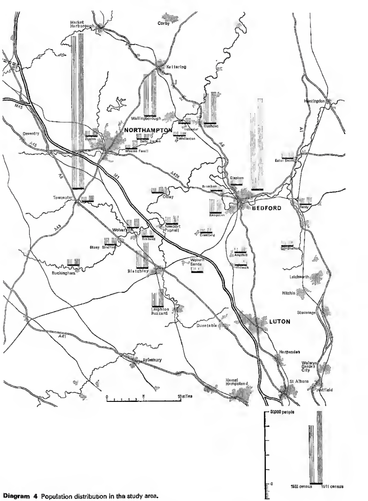


Diagram 4 Population distribution in the study area.

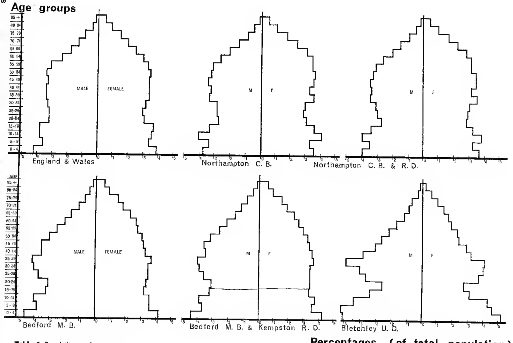


Table 1 Population age/sex structure.

13. The trends amongst the males will be paralleled amongst the females, but the actual decline in total numbers of women of middle age in Northampton would affect the age groups in which married women take to paid work most often.

14. Bedford, while smaller than Northampton, has a higher growth rate, the population of Bedford and Kempston together having increased from 53,000 in 1951 to 61,000 in 1961. This represents a rate of growth of about 1,000 a year, and this appears to be increasing, possibly due to the attractions of Bedford for inward migration.

15. The bulk of the increase at Bedford has been concentrated on the northern periphery, and this has had the unfortunate effect of accentuating an existing disparity between a predominantly residential area north of the river and an industrial one to the south. This had led to the development of a heavy work journey movement across the river, and the consequent serious traffic congestion at the bridges

16. An interesting policy of social integration has been followed at Bedford, apparently with success. Much of the immigration has been from London, and this has been phased with the normal town growth to produce a more homogeneous society. In addition a large number of foreign workers live in the area and are associated with the brick industries and they have tended to become concentrated in the areas to the south-west.

17. The age structure chart indicates that there is no pronounced emphasis in any particular age group, as compared with the national average.

18. Bletchley, by far the smallest of the three towns with a 1961 population of 17,000, is also the fastest growing, the 1951 population having been 10,000. This is due to the artifically-induced growth by the L.C.C. overspill scheme, designed to bring the population level to 24,000 by 1974. As may be expected from this type of development the age structure indicates a fairly young population, with only 27% of the population being in the over-45 age group (table 1).

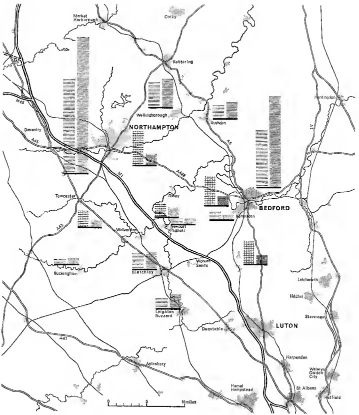
Shopping

19. Within the study area Northampton, with the most population, has the largest shopping centre. However, when the turnover is analysed and compared with the town size, it is found that Northampton has, proportionately, a smaller pull on its surrounding hinterland than Bedford, as indicated in diagram 5. It is difficult to assess why this should be. Bedford centre is undoubtedly thriving, and has a number of new developments with a high proportion of variety stores. Northampton on the other hand has a much larger centre, with a wide range of choice, although the whole centre is badly in need of redevelopment, which may be the key factor in its lack of growth. Bedford also has a fairly large hinterland which is heavily dependent upon it and to which it is readily accessible.

20. Bletchley is a much smaller centre and has comparatively little effect on the surrounding areas.

21. To the south, Luton, and the north-west, Coventry, have large and successful centres and have a certain amount of pull on the area. Further afield, London and to a lesser extent Birmingham generate the occasional shopping trip.

22. Northampton and Bedford both offer a wide range of facilities, although Bedford probably is the better provided due perhaps to the high proportion of skilled and professional workers there. Both towns have hospitals, a full range of local authority schools, library, museums and art gallery, and churches of most denominations. Bedford in addition has five independent and direct grant schools: Bedford School, Bedford Modern School, Bedford High School, Dame Alice Harpur School and the Convent of the Holy Ghost School, while Northampton



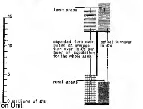

15
10
5
0 millions of £'s
town areas
expected turn over based on average turn over in £'s per head of population for the whole area
actual turnover in £'s
rural areas

Diagram 5 Shopping pattern in the study area.

has a School of Art and a College of Technology. Northampton has a wider choice of entertainment facilities with five cinemas and a repertory theatre.

23. Bedford has a large number of societies and clubs embracing sports, drama, music, natural history, art, literature, politics, etc. Northampton is the headquarters of the county cricket club, and has a first division football club and a rugby club. The town is very well provided with public parks.

Recreation

24. Broadly the study area is poorly provided with large scale natural recreational facilities. Being at almost the centre of the country all coastal recreation requires long journeys, generally to the East Anglian resorts. There are no National Park areas in the immediate vicinity, the inhabitants having to travel to the Welsh Hills for the nearest National Park facilities.

25. On the smaller scale, however, there is a wide variety of facilities available. To the south of the area the woodlands and protected areas around Woburn are very popular, especially for day or afternoon excursions. As well as the less organised facilities offered by the countryside, the presence of Woburn Abbey and its entertainments provides a special attraction. Ampthill Park, Whipsnade Zoo and Dunstable Downs also offer recreational opportunities in the south.

26. To the north the main recreational area is focused around Pitsford reservoir, a large lake formed by damming one of the valleys to the north of Northampton. Although activities obviously have to be carefully controlled here to prevent pollution, the lake is extremely popular for sailing and fishing. In addition, Billing Aquadrome, about 3 miles to the east of Northampton, provides a wide range of water sports and family activities.

27. Throughout the area the opportunities for recreation provided by the rivers and canal appear to be becoming increasingly popular. At Bedford it has been suggested that the river locks be restored and the river opened for pleasure traffic while at Northampton the river is already used for such trips. There is also an increasing demand for use of the Grand Union Canal for pleasure activities.

28. Billing recreational centre is a former gravel working, while Thrapston lake is another. The Nene valley, the Newport Pagnell area, the clay pits between Bedford and Bletchley, the Blunham, Biggleswade, Graffham and Great Linford pits are all potential water recreation areas.

Employment and industry

29. The study area lies between London and the South Eastern, the Midlands, the Eastern and Southern regions. Therefore it is likely to be influenced by the current employment and industrial trends of all of these surrounding regions, and accordingly each has been examined to determine its possible influences, and a comparison with the study area has been made (diagrams 6 and 7, table 2 and appendix 1).

30. Basically in all four regions, the service industries are increasing at the expense of the manufacturing and extractive industries. This is a phenomenon which is likely to continue, being most pronounced in those regions containing very large centres.

31. The most important single section of industry exhibiting continuous expansion in all three regions is the engineering and electrical group. This is well represented in the study area, and its significant growth in recent years could prove to be a great advantage to the future industrial economy of the area.

32. Other major growth industries, paper and printing, food, drink and tobacco, are poorly represented in the study area, but show moderate increases. Chemicals

	May 1954	May 1959	May 1961	May 1963
London & S.E.				
Primary	1.9	1.5	1.4	1.3
Manufacturing	36.3	32.8	33.3	32.0
Services	61.8	65.6	65.3	66.7
Eastern & Southern				
Primary	8.9	7.1	6.1	5.4
Manufacturing	35.1	34.5	35.6	35.5
Services	56.0	56.4	58.3	59.1
Midlands				
Primary	6.0	5.5	4.5	6.5
Manufacturing	56.6	53.4	55.1	50.0
Services	37.4	41.1	40.4	43.5
Rest of Great Britain				
Primary	10.2	9.4	8.3	7.4
Manufacturing	41.9	48.8	55.1	47.9
Services	47.9	41.8	36.6	44.7

Proportions employed in primary, manufacturing and service industries, by regions

Table 2: **Employment structure of the regions**

have had a large percentage increase in recent years, but the industry is so lightly represented as yet that it is impossible to attach major industrial significance to it.

33. The largest single manufacturing industry for the study area, clothing and footwear, has shown a considerable and steady decline in both the area and, with the exception of the Midlands, its surrounding regions. There is at present nothing which would indicate a change in this decline in the foreseeable future.

Service industry

34. The study area has shown an increase in the proportion of its workers employed in service industry. However, this proportion is still below those for the regions, and the tendency for it to increase can be expected to continue.

35. Distributive trades, professional services and miscellaneous services have all shown significant increases in the surrounding regions which have all been echoed within the study area. An important exception is banking and insurance

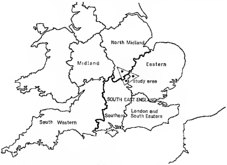


Diagram 6 Ministry of Labour regions.

which has exhibited a far greater increase in the study area than in any of the regions.

36. The study area has also followed the general pattern in the declining service industries, public administration and transport.

37. From this brief examination, it would appear that the employment situation is following the broad trends of the surrounding regions. The proportion of service industry is increasing and the pattern of increase and change is similar to that of the regions. The emphasis on the specialised footwear industry is declining in favour of a wider variety of industries.

38. Thus, it would appear that the study area has an industrial economy which is adapting itself to the changing national industrial pattern in a manner which can encourage future growth.

39. An examination of the area in broad outline inevitably conceals wider variations at local scale. To obtain a clearer picture of the employment patterns of the area, it is necessary to examine in more detail the situation at the major employment points, Northampton, Bedford and Bletchley (appendix I).

Northampton

40. Although unemployment is low in the Northampton Employment Exchange area, the unbalanced distribution of employment within the various industrial groups produces an unsatisfactory picture of employment opportunities. The

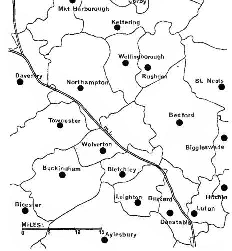


Diagram 7 Employment exchange areas.

proportion engaged in manufacturing industries at approximately 48% is considerably higher than the national average of about 38.6%, and thus the opportunities for employment in service industries, including many office jobs, are considerably below those enjoyed by other towns. In addition, the manufacturing portion consists mainly of two dominant groups, the clothing and footwear at 15.7% and the electrical and engineering group at 13.3%. Thus not only is the opportunity of choice further curtailed, but the element of insecurity is presented by dependence on two very dominant industries.

41. The major single employment group in the town, clothing and footwear, has exhibited a steady decline in numbers and proportions employed. Since 1951 the proportion has fallen from 22.6% (15,625) to 15.7% (10,607). Were it not for the increase in importance of the engineering group from 9.4% (6,524) in 1951 to 13.3% (9,014) in 1963, the decline of its major employment group could have led to a similar set of conditions to that prevailing in the North East of England.

42. Other industries are relatively stable, with the exception of the chemicals group, which has shown an increase. Service industry, after a decline in the early 1950's, is now gaining considerably.

Bedford

43. The employment pattern at Bedford is of a different character from those at Northampton and Bletchley. The proportion of service industry is far higher, and although it is still not so high as the average for the South East region, it has shown a rapid growth in recent years. Banking and finance have almost doubled within 12 years. Professional services is the largest single employment group in the exchange area.

44. The structure of manufacturing employment is also completely different from that of the other towns, having a broad base with no great dependence on one or two industrial groups. The largest single group, engineering and electrical, has shown a steady increase since 1955. Proximity to the brickfields is reflected in the fairly important position of the bricks, pottery and glass group, which has, however, shown no great increase in the same period. The varied emphasis on the manufacturing groups combined with the important services group gives Bedford a stable employment situation with ample opportunity for choice of work.

Bletchley

45. Bletchley is the smallest of the three main employment centres and has been subjected to a large proportion of assisted growth. Its employment pattern reflects this in the very rapid growth of important manufacturing industries. Chemicals, although only employing some 200 people at present, has had a very high growth rate. Engineering and electrical, food, drink and tobacco, metal manufacturing and timber products have had proportionately less, but still significant, increases. The employment pattern is similar to that of Northampton, by being dependent upon one main industry, brickmaking. As at Bedford, employment in the industry has been relatively stable, and the town's employment increases have been absorbed by the other industrial groups. On the services side the most important increases have been in the professional section.

46. Thus, the more detailed examination of the employment pattern of the area reveals that Bedford is the only town not highly dependent upon one industry and with a wide range of employment opportunities. Both Northampton and Bletchley have a fairly small proportion of service industries and tend to rely heavily on one or two major industries to the detriment of employment choice.

Transport and roads

47. A description of the existing major road network and an estimate of its condition, potential and use is given in Appendix I. The major roads affecting the site are illustrated in diagram 3.

48. The site lies between the main regional and national communication links, from the Midlands and the North, which converge at Luton en route for London and the South.

49. The study area straddles the London—Birmingham motorway (M.1), thus providing easy access to the Midlands and the North (via M.45, M.6 and the proposed M.1 extension) and to London and the South. On completion of the first 1,000 miles of motorway, in the early 1970's, the Ministry of Transport may be obliged to concentrate their resources on urban projects and even tentative proposals for further motorways have not yet been conceived. However, the proposed expansions at Southampton and Newbury will create a need for improvement of the present communications, and it is conceivable that a new motorway (or trunk route) will be developed from Southampton to the Midlands.

50. Trunk road A.1 is being developed as a major north—south link and provides an alternative route to the M.1. Route A.6 serves the area between the M.1 and A.1 as an 'all purpose' sub-regional route, but considerable improvements are necessary through the urban areas, especially at Bedford. Traffic flows on route A.5 have now reached at certain times the level obtaining prior to the opening of the M.1. The other main routes of the network serve largely local functions but are potential links to the east, especially the cross roads from Bletchley to Bedford.

51. The long-term nature of this study has necessitated projecting transportation requirements beyond the Ministry of Transport's current motorway construction programme which is due for completion in the early 1970's. Developments of new cities at Southampton and Newbury, as proposed in the South East Study, and the expansion of the port of Ipswich for connections to northern Europe would require major improvements of existing roads or the construction of new motorways to these areas. Such future motorways between Southampton, Newbury, the Midlands and the North and between East Anglia and the Midlands could well increase the importance of the study area in terms of its national and regional connections.

52. This brief description of the existing road network and its national and regional situation must be supplemented by a short discussion of existing proposals for both improvements and new roads.

53. It has been suggested by Northamptonshire County Council that the A.6 major trunk route should be improved to motorway standards. An unofficial suggestion for an east—west motorway from the Midlands to East Anglia has been made and is in accordance with the assumptions made for this study. Both the A.509 and A.422 are being greatly improved while by-pass proposals have been made for Bromham, Clapham and Milton Ernest. Proposals for major by-passes for Bedford on the A.6 and A.428 have been made but both Bedford and Northampton rely on ring road systems for their future development. In both cases planning of these has reached an advanced stage and construction has begun.

Rail

54. Main rail lines from London to the Midlands and North pass through Bedford, Bletchley and Northampton. At present the Bedford line enjoys the better service and generates considerable commuter traffic to Luton and London. There is

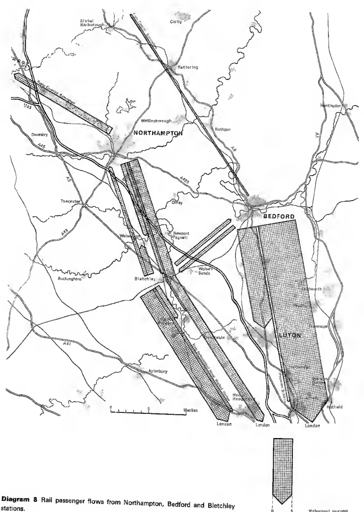


Diagram 8 Rail passenger flows from Northampton, Bedford and Bletchley stations.

also some counter-commuting from Luton to Bedford which enables a more economical service to be operated.

55. By 1966 the position will be reversed, and with electrification the Bletchley and Northampton lines will be provided with the better service. The journey from Bletchley to London will take less than 1 hour and that from Northampton 1 hour 20 minutes. This could bring the possibilities of commuting if a new town is sited at Bletchley, although the level of fares may well prevent this from becoming an important element. Major passenger flows at present, including commuting to London, are indicated in diagram 8.

56. Both the Bedford and Northampton lines have spare capacities almost equal to their present loadings, and thus there should be few problems of rail capacities for the increase in the area envisaged in the South East Study.

57. The southern part of the site is crossed by the Oxford/Cambridge rail line, but this has a comparatively low passenger use and is therefore of little regional importance. The line is now being considered for closure, except for freight, but any developments in the area might alter its relative importance.

Air

58. The suitability of the area for airfields has already been mentioned. Cranfield is the most centrally sited airfield in the study area, but development is restricted by the London to Birmingham flight corridor. The grassfield at Sywell could be developed to serve Northampton. Should Stansted be selected to meet the anticipated need for a third London Airport, a new cross-country road link would be required to provide effective servicing of the study area. The M.1 and A.1 and A.6 already serve the established international airfield at Luton which is expanding.

Canal

59. The site is crossed by the Grand Union Canal from London to the Midlands. This has a low commercial value by comparison with roads and railways, but its potential pleasure use is considerable.

Water and sewerage

60. The area is short of water and has sewage disposal problems, but it is assumed for the purposes of this study that these will be solved in accordance with whatever plans are prepared.

Town	1961 Existing Population	1961–1981 Natural Increase of 1961 Population	1961–1981 Net Migration inc. its own Natural Increase	1981 Total Population	1981–2000 Natural Increase of 1961 Population	1981–2000 Natural Increase of 61–81 Migration	1981–2000 Net Migration	2000 Total Population	2000 Total Net Migration	2000 Total expansion less Natural Increase of 1961 Population figure	2000 %
Bedford	63,000	8,000	30,000	101,000	19,000	14,000	—	134,000	30,000	44,000	70
Northampton	105,000	7,000	50,000	162,000	12,000	24,000	26,000	224,000	76,000	100,000	95
Total	**168,000**			**263,000**				**358,000**	**106,000**	**144,000**	
North Bucks	17,000	4,000	75,000	96,000	7,000	36,000	39,000	178,000	114,000	150,000	
Total	**185,000**	**19,000**	**155,000**		**38,000**	**74,000**	**65,000**				
		174,000		**369,000**		**177,000**		**536,000**	**220,000**	**294,000**	

Table 3: **S.E. Study proposals, 1961 population corrected to 1961 Census**

Bedford	63,000	8,000	30,000	101,000	19,000	14,000	—	134,000	30,000	44,000	70
Northampton	105,000	7,000	50,000	162,000	12,000	24,000	—	198,000	50,000	74,000	70
Total	**168,000**			**263,000**				**332,000**	**80,000**		
North Bucks	17,000	4,000	75,000	96,000	7,000	36,000	65,000	204,000	140,000	176,000	
Total	**185,000**	**19,000**	**165,000**		**38,000**	**74,000**	**66,000**				
		174,000		**359,000**		**177,000**		**536,000**	**220,000**	**294,000**	

Table 4: **Optimum redistribution of S.E. study increases**

Bedford	63,000	8,000	30,000	101,000	19,000	14,000	16,000	150,000	46,000	60,000	95
Northampton	105,000	7,000	50,000	162,000	12,000	24,000	26,000	224,000	76,000	100,000	95
Total	**168,000**			**263,000**				**374,000**	**122,000**		
North Bucks	17,000	4,000	75,000	96,000	7,000	36,000	89,000	228,000	164,000	200,000	
Total	**185,000**	**19,000**	**155,000**		**38,000**	**79,000**	**131,000**				
		174,000		**359,000**		**248,000**		**602,000**	**286,000**	**380,000**	

Table 5: **Assessment of optimum possible increases within limits of expansion integrated with the existing town structure**

Chapter 3: Assessment of development at Northampton, Bedford and Bletchley

Northampton

Introduction

1. Northampton is an old county town of county borough status, located in a shallow valley at a crossing point on the River Nene, and at the centre of a web of roads. The central area and the major part of the town are located on the south facing slopes on the north side of the river, leaving undeveloped flood plains to penetrate almost to the heart of the town (diagram 9). Northampton is only 3 miles from the M.1, very close to the M.6 junction.

Population

2. The Registrar General's population estimate for 1961 was 105,000. In April, 1965, the boundaries of the county borough will be altered to include a number of expanding villages that are closely associated with Northampton, to bring the population up to about 120,000.

3. As mentioned in Chapter 2, paragraph 11, the population of Northampton contains a high proportion of older people, 40% being over 45, while the most pronounced deficiencies as compared with the national average occur in the age groups below 35, except for a current bulge in the teenager group. The future decline in both skilled male workers mentioned in Chapter 2, paragraph 12, would be corrected in any expansion of the town by immigration of families with children. This is comparatively more important in the case of Northampton than for any of the other towns in the study area.

4. However, if the total population increase for the greater Northampton area during the period 1951–61 of 13,000, or about 1,000 per annum, is maintained, there will be about another 20,000 people in the town by 1981. If the rate of increase of Northampton during the last four years is maintained this figure could be very much larger. On this basis, therefore, it would appear that the South East Study estimate of 50,000 increase by 1981 (table 3) is likely to be reached without a great deal of additional encouragement.

Employment

5. Although there is a low rate of unemployment in Northampton, the strong emphasis on manufacturing industries produces a narrow range of employment opportunities. As explained in Chapter 2, paragraph 40, the proportion of people employed in manufacturing industries is much higher than the national average and, moreover, is largely concentrated into two dominant groups, the declining group of clothing and footwear and the increasing group of electrical and engineering.

6. To improve the present employment position, it would be necessary to broaden the base of overall employment and increase the range of opportunities available by the creation of new jobs in the less developed groups of industry. This would also have the effect of increasing the proportion of service industries which have been showing a slight growth in the area during the recent years, but are as yet still under-represented in Northampton, and well below the national average. The re-location of offices from London and elsewhere should be encouraged. This would broaden the employment opportunities and the social structure of the town.

7. The industry with the highest rate of expansion in Northampton is the electrical and engineering group which is currently a growth industry at both national and regional levels. It is already one of the major industries in Northampton, and would probably be the mainstay of a future development programme, although precautions should be taken to avoid it assuming a dominating role in the industrial structure of the town. Emphasis should rather be placed on encouraging the growth of some of the minor local industrial groups, such as chemicals, which are already beginning to expand at Northampton and in the surrounding regions.

8. The site of Northampton on the main lines of communication between London, the Midlands and the North could be used as an inducement to the relocating industries that are particularly market-conscious, many of which might be of light manufacturing character. Several warehousing and distributive organisations have already made applications for development, and this may be an encouragement to offices which are wishing to relocate in the area. Local firms anxious to expand and industrial organisations wanting to settle in Northampton have been restricted by Board of Trade policy, which up to now has been based on normal growth rates for the town. Induced accelerated growth for the town would no doubt justify a reappraisal of the present policy.

9. Summarising, it would appear that there will be no problem in expanding the town to the size envisaged in the South East Study as the natural rate of growth alone may approach this figure, but emphasis should be placed on the attraction of married families with children if possible. Similarly, there would appear to be no problem in attracting industry to the town, but emphasis should be laid on increasing the range of opportunities available by encouraging the minor local industrial groups, and also service industries and offices.

Land use

10. As previously mentioned, the town has mainly developed from a centre situated on the north bank of the River Nene which runs approximately east–west. In addition, a north–south railway line and associated railway yards effectively divide the town into eastern and western portions. This quartering of the town provides a breakdown of land uses in which the north-east quarter is occupied by the town centre and most of the town's residential area, the south-east quarter is currently an undeveloped flood plain in the river valley, with some residential uses on the hill slopes, the south-west quarter is largely undeveloped and the north-west quarter also has a small proportion of residential use. Industry is mainly concentrated in the vicinities of the north–south railway line and the east–west line of the river banks (diagram 10).

11. Because of the influence of major regional connections to the north and east and the restrictions provided by the north–south railway line, and the flood plain of the river to the south, the town has developed from its centre almost exclusively in a north-easterly direction. This directional growth is still continuing and several outlying villages now form part of the built-up area.

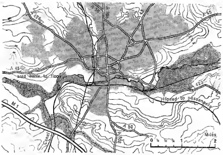


Diagram 9
Topography built-up area and lands liable to flood.

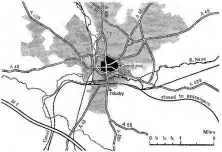


Diagram 10
Generalised land uses showing central area, industry and residential areas.

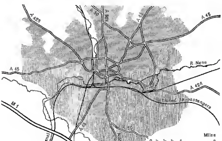


Diagram 11
Areas recommended for expansion.

12. The north–south railway line, which effectively divides the industry in the west from the major residential area in the east, acts as a barrier and aggravates the work journey problem causing considerable traffic congestion on the connecting roads and bridges.

13. The central area of the town lacks a wide range of public facilities and for this reason is not very attractive to offices, servicing or manufacturing industries wishing to move from the London area. In addition, the existing condition of many parts of the area is poor, and the land use pattern is confused. The development of the central area should now be considered in relation to the overall plan for town expansion.

14. The development of the town to the north, the east and the west has been carried out sporadically and unevenly as suitable areas for building became available. Nearby villages at first expanded but then later became absorbed in the outlying growth of the suburbs. There are still a few opportunities for some small-scale building to be undertaken as infilling along the uneven northern periphery of the town although the population this could accommodate would be limited to a few thousand. Current building programmes are continuing this northerly advance, absorbing nearby expanding villages, and thereby increasing the distance to central area facilities and work, and intensifying transportation difficulties. Because of these disadvantages, this northerly trend should be discouraged when the expansion programme has been started.

Expansion sites

15. However, there are available large areas of land, close to the existing town centre, which have for various reasons not been developed. These areas, to the south-east and south-west of the town, would provide sites for organised town expansions, completing the concentric built-up pattern of the town (diagram 11).

16. These two sites have not been developed since the one to the south-west is zoned as an area for the extraction of ironstone and the one to the south-east is liable to flooding over the area adjoining the river. The ironstone deposits do not present an insoluble problem to the development of the site, as it is possible either to programme their exploitation in advance of development, or to compensate the owners for the loss of mining rights. The flood plains to the south-east present more serious physical difficulties involving costs in drainage and reclamation, although beyond the plains the land rises to a pleasantly wooded ridge. The power station and overhead lines will also present problems. These two sites could provide for the construction of an expansion scheme of the order of 100,000 people, planned as an integral part of the town structure.

17. The precise extent of the expansion of the town could only be determined on the basis of further study in relation to the preparation of an overall plan dealing with the relocation and dispersal of employment centres, the pattern of environmental areas, the development of the central area and the working out of a revised communications structure. It is possible that expansion on a scale larger than that envisaged in paragraph 16 would be practical and desirable but further consideration of patterns of growth in excess of the figures suggested in the South East Study is undertaken in Chapter 5.

Communications

18. The road pattern of the town is seriously overloaded with through traffic to and from the motorway and internal traffic which is causing deterioration of the environmental quality of the central area and other parts of the town. Links

between industry on the west of the railway lines and residential areas on the east are poor and need improvements. The access links to the M.1 provided by routes A.45 and A 508, diagram 11, require improvement and should be re-aligned to form the northern and eastern by-passes of the town and integrated with the planning of the expansion.

19. Northampton is on the main London to Birmingham railway line, 1 hour and 20 minutes from London. The line is at present only being used to 60% of its possible capacity, but it is being electrified and this work will be completed next year. The electrification will produce a very good service to London, the Midlands and the North, but although increasing the attractiveness of the town as a location, it could also produce some possibility of commuting. At present, travel cost and time prevent this from becoming a serious problem.

20. The established and expanding commercial airfields of Luton and Birmingham adequately provide for the needs of Northampton. However, private executive and freight trips could be accommodated at either Cranfield, by arrangement, or Sywell if improved. The improvement of Sywell airfield could prove an additional attraction to the development of Northampton, although it is unlikely to develop much beyond the status of a private airfield or heliport, because of the proximity to established commercial airfields.

21. The expansion of Northampton is feasible and it is recommended that immigration should be of the order of 50,000 between 1961–81, including its own natural increase for that period and a further 50,000, including its own increase, by the end of the century. There should be no problem in providing suitable employment opportunities for these populations. Two areas, to the south-east and south-west of the town, could prove suitable sites for the expansion. A transportation survey and plan for the whole town will be required and there will also be a need for comprehensive development of the town centre. The possibility of further population growth in the locality should be kept in mind in the preparation of the plans; this is discussed further in Chapter 5.

Bedford

Introduction

22. Bedford is a well established and prosperous market and county town of municipal borough status, located in a shallow valley at an important crossing point of the River Ouse. The central area and major part of the town is located on the northern bank of the river, but with the associated urban district of Kempston, the overall pattern of development becomes more circular (diagram 12). Bedford has considerable character and is also a progressive town with a wide range of public facilities, and a noted centre of education. The town is only 1 hour away from London by train and is thus just within reasonable commuting range. It is 9 miles from the M.1 motorway on the west and 7 miles from the improved A.1 on the east. The town is currently expanding quite rapidly and is obviously attractive, so that it would seem to be well suited to support a major expansion scheme as suggested in the South East Study.

Population

23. In the period 1951-61 the population of Bedford, excluding Kempston, increased rapidly in size from 53,000 to 63,000. The South East Study proposes to expand the population by 30,000 by 1981, which together with a natural increase of 8,000 would give a total of 101,000 people, or 109,000 if Kempston is included

(table 3). The current rate of growth of about 1,000 people a year is planned to be doubled, so that the population of Bedford would reach about 85,000 by 1971; this will undoubtedly continue to increase without special incentives to something considerably in excess of 100,000 by 1981. Because of the town's excellent location and inherent attractiveness to offices and industries moving from London, this figure could continue to rise to about 150,000 and even that figure could be attained as early as 1981, if the rate of growth was doubled again in the decade 1971–81. If this did prove to be the case, a slowing down of the rate after 1981 would still give a population of the order of 200,000 by the end of the century. At this stage in growth this would give an urban area, if contiguous, about three times as big as existing.

24. It would be possible, on the sites for expansion presently to be discussed, to accommodate a development of Bedford that would bring the total population up to about 150,000 including Kempston by the end of the century. This would confirm the South East Study's initial estimate of 30,000 immigrants by 1981, (including their own natural increase) but in addition would recommend a further increase of population in the order of 30,000, made up of 16,000 new immigrants and 14,000 natural increase of the first group of immigrants, making a total expansion of 60,000 exclusive of the increase of the present population. The larger figure of 200,000 mentioned above will be discussed in paragraph 35.

25. The effects on the existing population structure of an increase of about 95% are difficult to estimate. The area currently has a relatively balanced age structure with only 35% of the population in the over-45 age group compared with the national average of 37%. This percentage would probably be still further reduced by a large expansion policy. There are no dominant age groups, the whole age structure being very evenly balanced numerically through the normal range. There is a colony of foreign workers, living to the south-west of the town, who are employed in the local brick industry.

26. The social structure of the town is reflected by the fact that 16% (7,500) of the working population are employed in the professional services group which is a similar percentage to that of Oxford or Cambridge. Bedford is not only an educational centre but is also surrounded by a number of technical and research institutes, the employees of which probably use Bedford as their local centre. The town expansion programme would help to concentrate within a relatively close area a sufficient number of people to support a considerably improved range of public facilities, which would increase again the attraction of the town for more inward migration.

Employment

27. Bedford has a fairly strong industrial emphasis with almost 40% of its employed population working in manufacturing industries. There are about half a dozen large manufacturing firms within the urban area of Bedford employing more than 1,000 employees each and most of these are in the expanding group of engineering and electrical industries.

28. To balance the figure of 40% in manufacturing industries just over 50% are employed in service trades and, as mentioned in paragraph 28 above, 16% of the total employed population are of professional status. Bedford, it would seem, has a definite attraction for offices and research institutions wishing to re-locate from London. While it would appear a reasonable policy to allow this trend to continue and thereby concentrate in the vicinity a number of people and organisations of similar interest, taking the study area as a whole, it would ultimately be more important to build up a wider range of opportunities at Northampton and, when the time comes, at Bletchley, and place more emphasis at Bedford on widening the industrial opportunities available to people moving into the town.

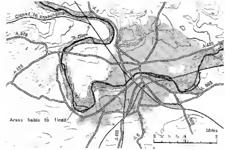


Diagram 12
Topography built-up area and lands liable to flood.

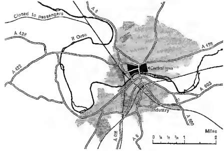


Diagram 13
Generalised land uses showing central area, industry and residential areas.

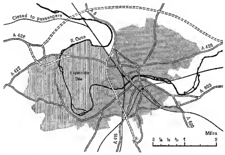


Diagram 14
Areas recommended for expansion.

Land use

29. Industry is mainly located south of the river, with only isolated pockets on the north bank. Complementing this pattern, about three-quarters of all housing is located on the north side of the river around the main commercial centre (diagram 13). This segregated distribution of major land uses aggravates the work journey problem and results in considerable traffic congestion at river crossing points. To complicate matters still further, several large educational institutions are also located south of the river.

30. There is currently an active programme of development of residential areas covering about 550 acres of land on the south-facing slopes of the hills on the north side of the town. This area will accommodate about 15,000 people, but for the large scale expansion scheme envisaged in the South East Study new sites for development have to be investigated.

31. However, there are unfortunately a number of restrictive land uses surrounding the urban area of Bedford which significantly reduce the choice of sites suitable for expansion. To the north is the Royal Aircraft Research Establishment and the proposed alignment of the A.428 east—west trunk road by-pass, to the south-east there is the Cardington Balloon Barrage Depôt, to the south-west there are considerable areas of brick clay and their associated brickmaking kilns, and to the immediate west is high quality agricultural land. There are three sites suitable for consideration as areas for expansion.

Expansion sites

32. The area to the north-east is relatively good agricultural, undulating, south-facing hill slopes but it is located beyond the proposed alignment of the A.428 east—west trunk road by-pass, at a distance of about 3–4 miles from the railway station. While the alignment of the road might be changed, there are considerable problems of accessibility in removing the new expansion proposal a considerable distance from the town centre and railway station, on to the other side of the present development.

33. The area to the south is good agricultural land and closely associated with the industrial area of the town, but it is flat and uninteresting, far from the railway station and, most important, in the lee of the brickworks and liable to unpleasant sulphurous fumes. Although it is understood that these are not dangerous to health, there seems to be no likelihood of foreseeable technical developments eliminating this nuisence, which is likely to continue throughout the estimated life of the brickfields, a period of 80–100 years.

34. The area to the immediate west of the town, within the bend of the River Ouse, and 1–1½ miles from the railway station, is high quality agricultural land located close to the existing town centre, and partially occupied by the village of Biddenham, and a golf course. These factors have previously combined to exclude this area from consideration for expansion, in spite of its excellent location and surroundings in relation to the existing centre. Even if this site is ultimately too small, or forms part of the open space system of the new expansion, there is still the site further to the west just beyond the line of the river, south of Bromham. Here the land forms are more interesting and centre around a north-east, south-west spine of hills overlooking the river valley. The site is on the motorway side of Bedford and fairly close to Cranfield Airfield. Although it would be the most difficult of the three sites to develop, together with the area to the south of Biddenham it would offer by far the most interesting area for an imaginative town expansion scheme (diagram 14).

35. The site is accessible and close enough to the existing town centre and of a suitable size for the construction of a town expansion scheme of at least 30,000 people planned as an integral part of the town structure on the scale envisaged in the South East Study. Expansion by a total of 60,000 to bring the population of the town up to 150,000,* as suggested in paragraph 24, would also be possible on this site, as an integral part of the town. Expansion beyond this towards the figure of 200,000 mentioned above would probably be impossible if conceived as an integrated part of the town, because of difficulties in public transport and communications. However, if it could be determined now that eventual expansion of this size will be necessary, then the initial stages of town expansion should be designed to allow for long term growth in the future. Patterns of development which could accommodate future growth and which could be applied to Bedford are discussed in Chapter 5.

Communications

36. Bedford is well located in relation to London, being only 50 miles or 1 hour away by train. At present about 300–500 people regularly commute to London and another 100–200 to Luton. It is also located between the diverging lines of the M.1 and A.1 radiating from London.

37. Bedford is at the centre of a radial road pattern. This has obvious commercial advantages, but results in the presence of through-traffic in the streets of the town. It is proposed to relieve this congestion by the construction of two by-pass roads, taking the A 6 north—south trunk road to the west of the town and the A.428 east—west trunk road north of the town. In addition, there is a borough proposal for an inner-ring road, and a pedestrian core in the shopping centre. However, expansion of Bedford on the scale envisaged in the South East Study or as suggested in paragraph 20 will necessitate a comprehensive plan for roads and public transport throughout the town coupled with a re-appraisal of the capacity of the town centre to provide the necessary central area facilities for a town with an eventual population of perhaps 150,000 or 200,000.

38. There are no immediate proposals to improve the diesel rail link with London, but the passenger service on the east – west Cambridge/Oxford rail link is scheduled for closure.

39. The nearest existing commercial airfields are those at Birmingham and Luton, which adequately provide for the needs of Bedford, but landings for private executive and private freight trips could be arranged at Cranfield Airfield, 8 miles to the west.

Summary

40. The obvious attractions of moving to an established county town with the amenities and character of Bedford are an already accepted fact, as borne out by its rapid growth rate during the last ten years. This factor, coupled with that of its good location in relation to London and north—south lines of national road and rail communications, makes it an ideal area for planned immigration. It is feasible to expand the population of the town by 30,000 as envisaged in the South East Study, but a more realistic size would be an eventual immigration of 80,000 of which 30,000 would have arrived by 1981. Similarly, employment opportunities can be expanded but emphasis should be placed on attracting manufacturing industries. A site to the west of the town will provide enough land, close to the town centre, for expansion to the above size, planned as an integral part of the town structure.

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* Inclusive of its own natural increase

41. The town centre of Bedford is being redeveloped but, in the light of town expansion of the scale mentioned above, it will be necessary to reconsider this. In addition a comprehensive plan for the organisation of all roads and public transport throughout the town will be required.

42. If, as seems possible, expansion of the town accelerates and is likely to give an eventual population in excess of 150,000, then further consideration should be given now to expanding Bedford in a way that the initial stages of development could provide for future long term growth. These problems are discussed in Chapter 5.

North Bucks/Bletchley

Introduction

43. Bletchley is a town that has grown up around a crossing point of two railway lines and merged with another settlement, Fanny Stratford, that grew up around the crossing point of the Grand Union Canal with Watling Street (A.5). It is located on open, softly undulating clay land, in the valley of the River Ouse, just to the west of a ridge of tree-clad hills. Bletchley is only 4 miles from the M.1 motorway and this strategic location may be still further enhanced by the improvement of connections from this area to Southampton and Ipswich. This would make the area near the town of Bletchley an excellent choice for one of the new cities envisaged in the South East Study.

44. The existing urban district of Bletchley had a population of about 17,000 people in 1961. Negotiations with the London County Council under the Town Development Act resulted in an agreement to accept about 10,000 immigrants into the town from the London region. The Town Map was amended accordingly, to give a phased programme of development up to a total population of 24,000 by 1974. By 1964, the Census showed that the population had risen to about 20,600.

45. The South East Study proposed a new site in the Bletchley area as a location for a new city of about 150,000 people (table 3) with a possible long-term growth to 250,000. It was suggested that by 1981 a growth of 75,000 might be achieved. This would mean an intake of about 5,000 persons a year, and would probably give a strong bias towards a relatively young population structure in the new city. Evidence of this can already be seen in the expanding town of Bletchley where only 27% of the population is over 45 as compared with the national average of 37%, as mentioned in Chapter 2, paragraph 11.

46. The effect of a population of the magnitude suggested above on the existing small towns of the area would be considerable, and it has been suggested by Buckingham County Council in connection with their own proposals for a new city at Bletchley that some of these towns should also be expanded as part of a total plan for the north of the county. The towns involved, and their population increases, are:

Bletchley	35,000	Buckingham	15—18,000
Wolverton	10—12,000	Newport Pagnall	12—15,000
Winslow	9—11,000	Olney	9—15,000

This gives a total growth of between 90—106,000 people in the Buckinghamshire towns concerned, beyond that of the growth at the new city near Bletchley, which the County Council think could be about 250.000. While this latter figure is not inconceivable, the validity and economic feasibility of expansion of these other towns by the numbers suggested above cannot be investigated in this study, except in the sense that Wolverton, Bletchley and Newport Pagnell may be almost physically part of the development of the new city at a site near Bletchley.

47. The social problems involved in attracting the first immigrants to an area where a new city is to be built have already been well documented in the case of the New Towns programme. It is sufficient to acknowledge that initially there will be a serious absence of public facilities in the city which could significantly detract from its acceptance as an area suitable for re-location by large-scale industrial enterprises. Conversely in the later stages of growth, when the city is approaching its ultimate size and has established its own character and provided a full range of public facilities, it might be quite difficult to slow down the pressure of development, because apart from any deficiencies in facilities in the early stages of growth, the location of the site is likely to be attractive to a very large number of organisations wishing to move from London.

48. The attractiveness of the site is probably responsible for the fact that the town of Bletchley has almost doubled its population since 1951. The nearby towns of Northampton and Bedford have an immigration rate well in excess of 1,000 people a year. They have the initial advantage of being able to attract immigrants to an established town with a wide range of public facilities and employment opportunities, but this advantage will become less dominating as the development of the new city begins to create its own image of a new way of life with high standards of environmental design, an organised system of transportation and a wide range of employment opportunities, as discussed later in Chapter 4 paragraphs 11–16.

49. The South East Study proposes a population of about 75,000 for the new city in 1981, rising ultimately to about 150,000. As mentioned in paragraph 45 above, this would mean an intake of about 5,000 people a year up to 1981, decreasing to about 4,000 a year after that, just when the new city is beginning to have its greatest attraction to immigrants and industrialists. But it is considered that the optimum size for a large city, using conventional city planning forms, is more likely to be of the order of about 200,000 as it is at this size that the most satisfactory compromise between the following conflicting arguments may be reached.

(1) The larger or more concentrated the population, the wider the range of public facilities and employment opportunities that it can support.

(2) The smaller or more dispersed the population, the greater the private mobility, and absence of congestion, becomes

50. Therefore, it would seem that as the possible sites for the new city are so well located in relation to London, the M.1 motorway and other lines of national communication, and as there is no obvious shortage of land in the area, there should be no ultimate limit to the size of the city, except that imposed by the criterion of a reasonable degree of mobility With a high level of car ownership this could possibly only be attained with conventional plan forms if the size of the city did not exceed about 200,000. If this can be said to be true, then there seems to be no reason to limit the size of the new city of Bletchley to 150,000 as suggested in the South East Study, but rather to plan it for a population of 200,000. The rates of increase mentioned in paragraph 49 would seem reasonable for the programme, and would give an immigration of 75,000 by 1981, as envisaged in the South East Study, rising to an ultimate immigration of 200,000 by the year 2000 (table 5).

51. The discussion so far has been concerned with a new city conceived as a concentrated unit or possibly as a series of smaller units closely grouped around a central one, which are designed with a relatively finite ultimate population in mind. If, however, the character of the new city, or its employment opportunities,

or the attractiveness of its location, caused it to expand beyond the ultimate size originally conceived, there would be considerable problems of mobility and accessibility. If it can be determined now that there is a possibility that this situation may arise and that the city might expand to perhaps 300,000 or 400,000, then consideration should be given to solving these problems. They might be resolved if the city is designed to allow for indefinite future growth possibilities as a long-term planning policy. Patterns of development which provide for these eventualities, if they become necessary, are discussed in Chapter 5.

Employment

52. The existing town of Bletchley has a very strong emphasis on manufacturing industries with 56% of its working population employed in them. Of these, 26% (3,300) are employed in the dominating but static group of brick manufacturing. The next largest sector is engineering and electrical industries with 8% of the employed population and this shows a slight tendency to expand. To widen the range of employment opportunities available, the existing town needs more service industries and offices, but these are unlikely to come until the construction of the new city makes this a more attractive area for these purposes.

53. However, there will probably be no difficulty in attracting a range of industries as soon as the new city is under construction, for as mentioned in paragraph 51 the site is well located for easy road or rail communication to almost any part of the country, and is particularly well related to the London and Birmingham conurbations. There may be difficulty in obtaining a wide range of industries, including service trades in the initial stages of growth, but this problem should become less acute as the number of manufacturing industries increases. Therefore, for the industrial growth and ultimate success of the new city, it is assumed that I.D.C.'s will be available to industrial organisations in London and the South East region wishing to re-locate at the new city near Bletchley.

Land use

54. The existing residential area of Bletchley is basically centred around the linear shopping street stretching between A.5 and the railway station, and around the railway station itself. The area designated for industry is mainly concentrated in one area along both sides of the A.5, just to the north of the town. The County Council has suggested three sites suitable for expansion on the periphery of the town, one to the north-west, one to the south near the brickworks, and one to the east of the River Ouse in the area currently scheduled as of great landscape value.

Development sites

55. There appear to be two suitable areas of land of a sufficient size, and relatively undeveloped, for the large-scale establishment of a new city. The first is an area lying next to the motorway, 3 to 4 miles north of Bletchley railway station in the direction of Wolverton (diagram 15). The site is adjacent to the A.5, the London to Birmingham railway line, the Grand Union Canal and the River Ouse. The land is an undistinguished, slightly undulating clay area, fairly open and undeveloped, except for about ten very small villages dispersed generally throughout the area.

56. The site is well related to the motorway and railway and fits well into the existing pattern of major urban centres comprising Bedford, Northampton, Wellingborough, Luton and Aylesbury. This is important in that it will eventually enable the new city to establish its own hinterland without too much encroachment on those of the surrounding towns.

57. A second site, less accessible to the railway crossing point, but physically more attractive, lies about 5 miles further to the north-west (diagram 15). This

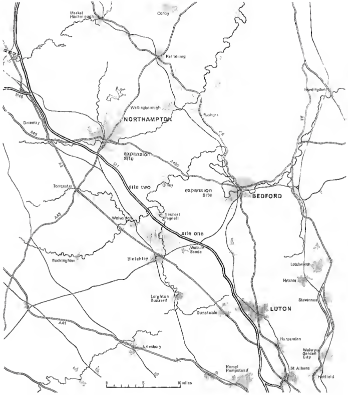


Diagram 15 Sites suggested for development in the study area.

site straddles the valley of the River Tove and the county boundaries of Buckinghamshire and Northamptonshire and is bounded by the motorway on one side and the A.5 on the other, and lies between the towns of Roade and Wolverton. The site is bisected by the London—Birmingham railway line, the Grand Union Canal, the River Tove and the A.508. By reason of the river valley and the canal and the five small villages located in it, it has rather more character than the previous site. It is mid-way between existing access points to the motorway and sufficiently close to Northampton to prevent the motorway from being used for local traffic between Northampton and the new city. However, this proximity would be a disadvantage as both Northampton and the new city will become major regional centres. There is also a Diplomatic Radio Station on the site which would require to be re-located.

58. Of the two areas, the one nearest Bletchley offers a more suitable location for the new city, since it is more open and easier to develop, and has a better relationship to the existing pattern of towns. This last factor would be especially important if it was decided to establish the city as the initial stage of a pattern of town developments allowing for infinite growth in the future, as mentioned in paragraph 61, instead of one new city of relatively finite size. A new city on this site should be related to the existing towns of Bletchley and Wolverton.

Communications

59. The existing town of Bletchley and the sites nearby are well located in relation to London, being only 50 miles away or about 1 hour by train, when the electrified line is opened next year. It is also located within 4 miles of the M 1 motorway on the direct road link between London and the industrial regions of the Midlands and the North and also has good access to the ports of Southampton and Ipswich.

60. Like Bedford, it is situated at a railway crossroads, but of the two north—south lines, the one through Bletchley is the more important. The east—west line is common to both towns and links Oxford to Cambridge. This line is relatively important for freight use, but may soon be closed for passenger use.

61. The commercial airfield at Luton which is expanding its handling facilities is only 15 miles away, and the airfield at Cranfield, which could be used for private executive flights, is only 6 miles away.

62. The Grand Union Canal passes through the town and while it is presently of low commercial value by comparison with roads and railways, it does have some potential for future development for recreation purposes.

Summary

63. The possible sites for the development of a new city are well located in relation to road and rail links between London and industrial regions to the north and will be sufficiently attractive to immigrating industries and people to establish a new city of the order of about 200,000 persons. There are two alternative sites available, suitable for a new city of this size, and accessible to the motorway and railway, but the one nearest Bletchley is better related to the existing pattern of towns, and it is recommended that this site should be used. The plan form of this city should be such that expansion will be possible beyond the initial target population figure, with a transportation system capable of phased construction to meet the increase in journeys as the city grows. This should include a conception of public transport which allows changes in form to suit current levels of demand and to embody the latest techniques.

Chapter 4: Optimum distribution of immigrants

Planning organisation for the study area

1. The arguments presented in Chapter 3 show that substantial expansions are possible at Bedford and Northampton, and that there are two areas in the vicinity of Bletchley that are suitable for a new city. Decisions on the sizes and relative desirability of these three developments depend on their inter-action with each other, their effects on the area and the suitability of the site or sites involved. The South East Study has proposed that the eventual sizes of the three developments might be in the order of 100,000 expansion at Northampton, 30,000 expansion at Bedford and 150,000 in the new city near Bletchley.

2. Town expansions and new cities have quite different advantages and disadvantages, which are set out later in this chapter. In order to evaluate the South East Study proposals for a combination of two expansions and a new city, two extreme possibilities of development will be considered. First, there is the possibility of concentrating all efforts on the expansion of Northampton and Bedford, and, second, there is the possibility of restricting expansion of these towns to a minimum and concentrating on the development of one large new city in the vicinity of Bletchley. Discussion of these two alternatives will help to clarify the merits or demerits of town expansions combined with a new city and will help to determine whether there may be any optimum distribution of the available population in any definable sense.

Town expansion

3. To provide for part of the population increase in the south-east, the Study has suggested that the Northampton/Bedford/Bletchley area should accept an expansion of 155,000 by 1981, rising to about 300,000 after this (table 3). The assessment studies in Chapter 3 show that in the long term Northampton could take only about 100,000 immigrants and Bedford only about 60,000 immigrants if the towns concerned were to expand in a conventional manner, based on re-developed centres and improved and re-organised movement patterns. By 1981 the expansion at Northampton might be about 50,000 and at Bedford about 30,000.

4. Thus, without introducing larger sizes of town expansions such as satellite developments or associated linear developments, the maximum increases that could be accommodated by Northampton and Bedford by 1981 would be about 80,000 and in the long term about 160,000. This is nearly two-thirds of the population which the South East Study suggests the area might accommodate, but the remainder could be provided for by a series of minor expansions in the small towns and villages in the area.

5. Although feasible, the desirability of concentrating all population increases into two expansions depends on an assessment of the advantages and disadvantages incurred, which are listed below.

Advantages

(a) Attraction of an existing town with an established administration, central area facilities, communications, services, industry, etc., increases the speed of development initially.

(b) Additional spending power of the increased population aids the development of the old central areas which may have been necessary in any case.

(c) The increased population can support more public facilities.

(d) There are better opportunities to integrate incoming people into the social structures of a number of smaller town expansions.

(e) Expanding an existing town gives an opportunity to correct old planning problems, improve and rehabilitate the environment of the original inhabitants and promote a new plan for land use, employment, parks, facilities, education, etc.

(f) Concentration of development around existing towns allows rural areas and important parts of urban areas to be conserved while other parts are re-developed.

Disadvantages

(a) Although the cost of development of town expansions over new towns is initially lower where they can be accommodated within the existing systems of roads, services, education, etc., once the development has exceeded the capacities of these facilities, or it is necessary to improve or replace them, the cost becomes higher than that of a new town. However studies of Peterborough and Ipswich for the Ministry of Housing and Local Government have shown that once major costs have to be incurred for the improvement or expansion of an existing town, the larger the expansion becomes, the more economic it is to build. These have suggested that to be relatively economic, the size of expansions should be in the order of 100%, but even this is not cheaper than building a new town.

(b) The cost of improving existing road systems and public transport to avoid congestion in an established town is very high.

(c) Town centres are usually difficult to expand and may require extensive or possibly complete and costly reconstruction or renewal to provide for the increased demands of the population.

(d) Existing towns suitable for expansion are not always well located for new industries, transportation systems, etc.

(e) Expansion and re-development of existing towns can cause complicated legal, financial and administrative problems.

Summary

6. Summarising, the most important advantages, especially in the early stages of growth, of expanding existing towns over building new towns are the increased speed of development, the possibility of immediate development, the rehabilitation of old but good centres and the attractiveness of existing towns. But these are offset by the increased cost, the physical and technical difficulty of expanding an existing town, and the necessity to expand by about 100% to be relatively economical.

7. A very large expansion will cause a significant change in the social and physical characteristics of the town. This could be an advantage or a disadvantage, depending on the existing conditions. At Northampton the 100% ultimate expansion suggested in Chapter 3 could be achieved, and would seem to be beneficial in that it would broaden the range of occupations and types of people living and working in the town. At Bedford, the 103% ultimate expansion could also be achieved, but it is doubtful if the social changes would be so marked, as the town already has a wide range of people and jobs.

8. Therefore, from a consideration of the advantages and disadvantages and effects of town expansions, assessed in paragraphs 5–7, it would seem that a plan for the area consisting only of town expansions would have certain advantages and would be acceptable, if the population of 294,000 that would result from the South East Study expansion proposals could be satisfactorily accommodated in the area. As mentioned in paragraph 4, a third of this population would have to be provided for by a series of minor expansions in the small towns and villages in the area. The distribution of about 134,000 people over the area would lead to a general increase in the volume of traffic and its associated problem of congestion. To provide for easy inter-communication, a plan for an improved system of roads and public transportation would be required. To implement this efficiently, it would be necessary to establish sub-regional lines of communication coupled with public transport and expanded towns, and this might be uneconomical for the size of the population suggested in the South East Study. How this problem might be solved is considered later in the chapter under the heading of 'Combined Scheme'.

9. While expanded towns have a short-term advantage of the possibility of immediate and rapid development and revitalisation of existing towns, the inherent disadvantage of high cost becomes more critical as the short-term advantages of rapid growth and town development are achieved. At Northampton and Bedford this disadvantage of high cost is acceptable because of the advantages gained and for the immediate implementation of the first stages of the South East Study. However, this high cost would not be warranted for a series of expansions at other smaller towns in the area, because, as mentioned in paragraph 8, unless an overall unifying transportation system could be created, they could not initially contribute to a co-ordinated development of the area.

10. Thus, the 134,000 population that might have constituted these uneconomic minor town expansions could now be collected together to form one new city, but it is necessary to determine whether in fact a population of this order would be appropriate in the context of the eventual expansions of 100,000 at Northampton and 60,000 at Bedford. As stated in paragraph 2, the possibility of restricting expansion at Northampton and Bedford to natural increase only, and concentrating on the development of one large new city in the vicinity of Bletchley, will now be considered in order to determine whether there may be any optimum distribution of the incoming population suggested in the South East Study, namely 155,000 by 1981, rising eventually to 294,000.

New city

11. A new city of this size is technically feasible but the rate of development would initially have to be in the order of about 10,000 people every year. To determine whether a new development of this size and rate of growth could be justified, an assessment of the advantages and disadvantages incurred are listed below. These are based on a fairly concentrated new city, either of one large unit or of a series of smaller units closely grouped around a central unit.

Advantages

(a) In the long term a new city is more economical than an expanded town.
(b) A large concentration of people can support a wide range of public facilities, employment opportunities etc.
(c) The city can be designed around an efficient public and private transport system.
(d) The image of a new city can in the long term be attractive to industrialists wishing to re-locate their factories.

(e) The new city can be located on the best site available that is related to its requirements, national communications, markets, etc.

(f) There is an established precedent for the administrative organisation of new towns.

Disadvantages

(a) In the initial stages, population growth will be restricted by lack of public facilities and services, lack of accommodation, shortage of labour, etc.

(b) For a period the city would lack a physical image or a social character.

(c) There would initially be difficulty in evolving the employment structure of the city to provide a wide range of job opportunities.

(d) The slow build-up of a range of employment might encourage commuting to London, which ultimately could be detrimental to the well-being of the city.

(e) A new city could in the long term adversely effect the economics of surrounding small towns unless they are partially expanded, although in the short term it would provide opportunities for retail trading and local employment.

Summary

12. Summarising, the building of new cities is cheaper but slower in the initial stages than the expansion of existing towns. This slow rate of growth is likely to be a critical factor against the choice of a new city for the initial implementation of the South East Study, as a high rate of growth is an essential requirement in the early stages.

13. Because of this slow rate of growth, at first the city would lack a physical image, an established character and many public facilities. Until the city developed beyond this stage to create its own new character with high environmental standards and an organised transportation system, there might possibly be considerable difficulty in attracting industries and especially offices. In the later stages of growth it might easily establish itself as a major regional centre producing development pressures so great that the city could not be restricted to the size originally planned. This would be a reason for designing a city that allowed for considerable future growth.

14. A single new city in this area to accommodate the immigrant population suggested in the South East Study would ultimately have a population of the order of 300,000. However, with conventional plan forms it would probably not be possible to obtain a high level of private transport unless this number was reduced. At about 200,000 persons a good range of public facilities, a good shopping centre and a wide range of employment opportunities could be provided, together with an efficient public transport system. These advantages could be increased if the city were larger, but there would be a progressive loss of mobility and increase of congestion.

Combined scheme

15. From the preceding investigation into the relative advantages of expanded towns and a new city, it becomes apparent that these two systems should be complementary in their actions within the Northampton/Bedford/Bletchley area. In the first stages, the advantages of an immediate and high rate of development, coupled with the possibilities of rehabilitating and replanning the existing town, render expansion schemes initially the most rewarding, in spite of their higher cost. In the later stages, a new city would gradually increase its rate of development to a higher level than that of an expanded town, and would do so at a lower cost, and eventually with better public facilities and a choice of transport could prove a more efficient and attractive counter-magnet than an expanded town.

16. Thus, there are many positive advantages in having a scheme which combines the advantages of town expansion in the early stages with those of a new city in the later stages.

17. The assessment studies in Chapter 3 confirm that in the long term Northampton could be expanded by about 100,000 (i.e. 95%) but that Bedford could be expanded by about as much as 60,000 (95%). This would give a total of 160,000 in town expansions, which if subtracted from the figure of 294,000 immigrants, would leave only 134,000 for a new city. However, as already discussed, for a conventional new city there should be considerable advantages in a size of the order of 200,000 people. A more advantageous distribution of the immigrant population would be Northampton 74,000, Bedford 44,000 and a new city of 176,000.

18. These figures do not approach the maximum estimates made under the earlier considerations of individual developments. The increase for Northampton of 100,000 and the new city of 200,000 will have considerable advantages if attained, while it is extremely likely that the estimate of 60,000 at Bedford will be achieved without great difficulty. This would give a total increase of 360,000 for the three main developments in the area, which in the light of more detailed study is probably more realistic than the South East Study figure. However, the figure of 360,000 represents the maximum figure for a combined scheme of town expansions and a new city, and increases beyond this figure would generate new planning problems that could only be solved by other forms of development, such as satellite towns or associated linear towns.

19. The difference between the population increase proposed in the South East Study and the maximum estimate if finite town expansions and finite new towns are adhered to is only 68,000. Difficulties in estimating future population increase and movements have been very apparent in the short space of time since the last war. A tolerance less than 100,000 in an area which may contain nearly one million people by the end of the century is very small. Therefore it is necessary to consider the effects should the South East Study prove to be an under-estimate, as now seems possible, and to examine some alternative development forms which could reasonably be expanded to accommodate a larger ultimate immigration.

Chapter 5: Principles for preparing the plan

Introduction

1. In Chapter 4 suggested scales of population increase and possible sites have been discussed and recommended. The brief requires consideration of a closer and more integrated grouping of the developments together with suitable sites, and a study of the problems of providing an adequate system of transport and communication allowing free movement between the separate parts of the development. This really involves the preparation of a plan which could not form part of a study as short as this. Therefore, the problem of considering different types of development has been tackled by investigating the various planning principles to be followed in preparing such a plan; these are discussed below.

2. Investigation of these principles has necessitated a re-examination of the assumptions made by the brief. This is based upon the South East Study which presumes an increase in the South East of 3½ million by 1981 of which 300,000 will be located in the study area. But forecasts available state that natural growth alone will continue to increase after 1981, to give perhaps a figure in the order of 20 million extra people for the country by the end of the century. It is possible that 8 million of these will live in the South East. These figures cannot be more than a rough estimate, as there are many social and economic influences that may affect them, nor can it be said that this increase would be entirely accommodated in this country.

Necessity for large-scale planning

3. These population increases would necessitate urban developments on a very large scale. The scale of developments so far considered in this report may have serious limitations on future plans designed to accommodate larger increases. This is especially true of the study area where, as has been indicated in Chapter 4, the difference between the increases proposed in the South East Study and those attainable with conventional plan forms may well be less than 100,000.

4. The attractive geographical location of the area will also make the effects of any unco-ordinated development on future overall growth plans more serious. The study area is midway between the two major conurbations of the country, and is bounded by important national lines of communication. It is readily accessible to the markets of the South and Midlands, to major manufacturing and administrative centres and to the ports on the south and west coasts. It thus has a high attraction for both industry and population, which gives it significant strategic importance. In any future national schemes designed to accommodate the possible population increase discussed, the advantages offered by the area could cause it to play a key part. Present developments could effectively sterilise the area if this is not given due consideration in the design process, and would thereby impose considerable restriction on the possible future national and regional proposals.

5. Therefore it is essential to begin to examine the context for the present study on a much wider time and space scale. It is suggested that a research group should be set up to investigate the problems of a wider view-point, evolve principles for urban growth on a large scale leading to an overall policy plan which could accept various future interpretations. If successful, such a policy plan could reduce the possibility of the developments considered at present becoming the problems to be faced at the end of the century.

National and regional effects

6. To show the scale of thinking that such a plan would require, and to highlight some of the problems involved, several possible organisations for national and regional growth patterns have been considered. These are illustrated in order to demonstrate how the developments now being considered for Bedford/Bletchley/Northampton could form the initial stage of a long-term urban growth policy, and would indeed condition its form and organisation unless consideration is now given to possible future requirements.

Social structure and land use

7. The most serious population expansion problems are generated by the conurbations and large towns, which use a comparatively small proportion of the total national land. The bulk of the country is populated by a series of small towns fairly regularly distributed in rural areas, with insignificant problems of land shortage and over-population. The temptation exists, therefore, to add surplus population from the conurbations to the small towns and countryside in a series of town expansions and new towns. This maintains the existing spatial relationships between towns and allows a good choice of sites. However, the advantages of major cities are intimately connected with their size. A large concentrated population generates a demand for public facilities, theatres, large libraries, colleges, sports centres, etc., and can support a range of choice in these. Minority interests can also be catered for and thus the total range of facilities available to a citizen becomes very wide. Shopping quality is influenced by population size, and it is only in the larger centres that a choice can be provided in specialist stores. A sizeable concentration of population offers many locational advantages to industry while in turn the diversity of industry attracted offers many advantages to the population. This can be in terms of choice, opportunities or generally a higher standard of employment.

8. These advantages of concentrated populations; better public facilities, greater choice in leisure, shopping and employment, etc., cannot be supported by a population which is widely dispersed throughout the countryside. A dispersed system would also interfere with many rural areas, at a time when the increased population will require more use of them for agricultural and recreational purposes.

9. A programme of finite new towns and town expansions could also limit the population which could be accommodated in any area. After a period of development, major centres would become established in an even network. New developments within the network would become commuter settlements to the larger centres. Unless this relationship is foreseen and carefully planned, the ultimate results could be as unsatisfactory as that in existing commuter developments.

10. Thus a policy of dispersed expanded and new towns such as that in diagram 16 would have little chance of success as a countermagnet to the major conurbations and, if it was implemented, could in the long term seriously damage the agriculture and large-scale rural amenities of the country as a whole.

11. In order to counteract the disadvantages of a policy of even dispersal,

protect major rural areas and establish conditions in which industrial development and higher public facilities would flourish, it would be necessary to evolve a policy for concentrating new towns and town expansion schemes into relatively small selected areas or sub-regions, where they could form an inter-related pattern of growth.

Transport and land use aspects

12. Two possible courses have been considered which could implement a policy of concentration. These are clusters of new urban developments, or linear groupings related to national lines of communication and major areas of settlement. Both lines of thought have their inherent advantages and disadvantages (diagrams 17 and 18).

13. While the advantage of concentration has been achieved in both cases, the collection of new developments into cluster as opposed to linear groupings could easily achieve the individualism and identity that is normally associated with the social image of the town. This might be achieved in linear growth by careful design and the use of existing large towns or new large centres as polarising nuclei.

14. New towns and town expansion schemes when grouped in linear form, while having problems of social identity, have a number of strong advantages. They can be more closely related to national lines of communication and thereby to other major areas of settlement, productivity and recreation, and they offer the possibility of infinite and inter-related growth, if this becomes necessary.

15. Certainly it can be argued that national lines of communication should not necessarily be determined by existing major areas of development, but should create new areas for future economic growth. It can also be argued that new development should not occur along existing national lines of communication but should create new axes of growth into new areas. However, it would seem that when these axes have developed sufficiently they in turn will become part of the system of national communications, evolving as some form of corridor growth.

Summary

16. These are possible avenues of investigation which the research group could pursue. Decisions on the plan to be adopted are beyond the scope of this report and it is only possible here to postulate possible affects on the principles of planning adopted for the study area.

17. The key position of the study area and the scales of development considered for it will impose considerable restrictions on any future organisation. On the other hand the discussions on long-term planning have indicated that there are a wide range of possibilities, any one of which could become the correct solution towards the later stages of the study period. Thus it becomes imperative that developments in the Bedford/Bletchley/Northampton area are planned in such a way that the possible range of overall plans into which they may ultimately fit is increased to the maximum extent.

18. It is proposed that this should be done by pursuing a policy of flexibility of design at both regional and town levels. To illustrate the major points involved in this type of planning and to provide a framework for future investigation, several alternatives have been examined at the various scales and are discussed below.

Effects on city components

19. So far in this report regional and national scales have been considered. To discover fully the implications of a flexible system of designing, it is necessary to examine the smaller scales of planning and their constituent parts. Only when

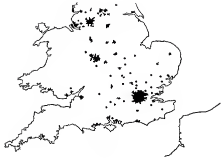


Diagram 16
Dispersed development—major built-up areas and places currently programmed for growth.

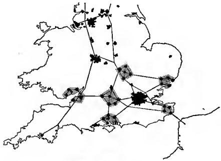


Diagram 17
Clusters of development—major built-up areas showing places of potential new development inter-related in the form of clusters.

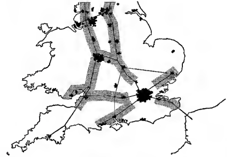


Diagram 18
Corridors of development—major built-up areas showing places of potential new development inter-related with each other within the limits of a corridor.

work of this kind has been done will it be possible to consider how such components can be organised to produce the overall flexibility required in the larger context.

20. One of the most important aspects of planning is the organisation of transport. While maximum accessibility is of paramount importance, the form this will take depends upon two variables, the standards of personal convenience demanded and the willingness or ability to pay for it. The increased use of the motor car is evidence of the demand for more personal convenience, but the willingness to pay for the ultimate consequences has not yet been demonstrated.

21. Clearly this is a decision which cannot be forecast, and therefore provision should be made in immediate developments for any of the range of possibilities to be fulfilled. This means, in effect, that development has to be planned to accept the possibilities of both maximum personal mobility and maximum public transport.

Public transport

22. Theoretical studies, combined with experience in the U.S.A., have shown that even with a decision by the bulk of the population to use personal transport, there will always be a proportion who use a public transport system. In addition it has been demonstrated that the transport system can be greatly reduced in cost if the bulk of the population can accept the use of public transport for the peak journeys, those from work to home and home to work.

23. A public transport system places considerable discipline upon the form and organisation of any town. Basically this can be summarised by saying that all forms of public transport move along a line, and stop to collect or distribute passengers at predetermined points. These stopping places become the focal points for the surrounding areas which can be divided into two concentric zones, that from which people walk to the stopping point, and that from which they would normally drive to it. The distance that people will walk to a stopping point is estimated at about 5—7 minutes or about one-third of a mile. The distance from which people will drive to a stopping point with no public transport alternatives is more difficult to determine as it depends upon a large number of variables.

24. The effect a public transport system would have of generating a series of catchment areas around its stopping points is illustrated by the accompanying diagrams 19 and 21.

25. Although a public transport system has definite implications on town form, the decision as to the type of system can be suited to demand and programmed to match the degree of personal mobility chosen by the community.

26. The problem becomes accentuated in a new development by questions of programming and phasing, especially in a development the ultimate size of which is indeterminate. Different sizes of town can support different types of public transport. A small town, or the first stage of a larger town, may barely be able to support a bus system, while at very much larger scales a rail system could be required. The uncertainty of the ratio of the demand for public and private transport systems, combined with the requirements arising from different stages of development, make it imperative that both the type of system and its relation to private transport be considered on a flexible basis.

Private transport

27. The system required to deal with the traffic generated by large-scale private mobility would have to be based on a clear road hierarchy, with pedestrian segregation from all but the most lightly-used roads.

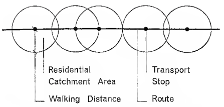


Diagram 19 Catchment areas generated by a public transport line.

28. The critical load expected for any road system is usually that generated by work journey movements. The peaks involved are dependent upon the degree of concentration of employment opportunities, an even disposition of employment and housing producing minimum peak demand. This relationship is illustrated by the theoretical calculations in Appendix II.

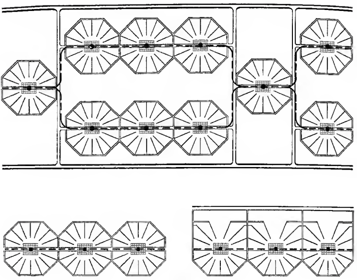
29. Studies carried out in America have shown that within about a 15-mile radius there is a comparatively even attraction of jobs for people. Beyond this distance the length of travel involved becomes significant and people are thus less likely to seek employment. Therefore, if optimum population densities for an area are assessed, and stipulations are made as to the degree of concentration of industry, a relationship can be formulated between developments and the roads required to serve them. Calculations illustrating this are given in Appendix II.

30. Investigations into the relationship between industrial and residential areas have indicated that an example proportion of about 1 : 3 is roughly satisfactory and using this proportion an arrangement of industry, residential areas and roads is illustrated in diagram 21. Other examples are given in Appendix II. For any overall pattern built up from the development principles outlined in diagram 21 the relationship between land use and road requirements will be constant. This is of great value in flexibility of design at the city region scale.

Combined transport system

31. The relative weights placed upon private or public transport will be determined by decisions as to which will provide the greater social benefit. Ultimately, however, both systems will be required, with the possibility of either becoming the main method of transport. Therefore, allowances should be made in the planning for maximum provision of either system to develop.

32. Interaction between public and private elements of the transport system has considerable influence on the organisation of town form. The requirements of both transport systems could be combined into a series of catchment areas which are also environmental areas. Designs for such areas should reinforce the original concept of pedestrian segregation from vehicles. Vehicular movement can be controlled by simple devices such as kerbs and bollards, but the pedestrian cannot be contained to a similar degree. Therefore planning should encourage a general pedestrian movement away from the main road system, possibly by the use of a Radburn plan with a central attraction point of public transport stop and



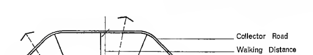


Diagram 20 Examples of residential unit organisation.

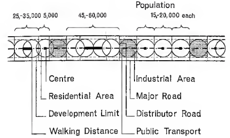


Diagram 21 Relationship of residential to industrial areas.

community facilities. If vehicular access is placed at the opposite extremity the natural internal circulation movements of pedestrians and vehicles would tend to separate. This is illustrated by the organisations postulated in diagram 20.

33. The requirements of walking distance to public transport stopping points result in a corridor of accessibility of varying width extending approximately 1,250—1,750 ft. on either side of the transport line. Addition of rather more car-orientated development on the extremities would result in an overall corridor of potential development of between ¾ and 1 mile wide. This could accommodate roughly 20,000 persons per mile length (though the principle would operate satisfactorily at much lower densities). If the relationship of residential to industrial land were 3 : 1 and similar walking distances were maintained within industrial areas, the overall land use organisation would be similar to that illustrated in diagram 21.

Social organisation and land use effects on city components

34. Most people consider it of paramount importance that their village, town or city should have its own character and identity. This is intimately connected with the way of life of the individual concerned and the environment he chooses to live in. Wide variations in personal taste foster demands for many environments, often of widely differing types. A major factor influencing the environmental type is the size of unit considered. A village of 5,000 people produces a different environment to a town of 60,000 which in turn differs from a metropolitan residential area. In a democratic society it is obviously essential to enable people to choose the type of environment they wish to live in. This in turn implies a large measure of uncertainty as environmental demands are both changing and difficult to forecast, and consequently the desirable distribution of settlements of varying sizes becomes indeterminate.

35. Utilising the principles of planning discussed, an overall plan can be produced well before the time when it becomes necessary to lay down specific sizes for residential units and centres. This would enable different types of environment to be developed according to current demands, instead of according to a previously determined plan, while still maintaining a planned overall structure. The largest residential unit which could be accommodated in a line of development would be related to the maximum walking distance, but its population may well reach

50,000 or even 100,000 people. Larger towns would inevitably be composed of a series of walking distance units grouped together and linked by transport systems to a major centre.

Summary of effects on city components

36. Thus the major demands for flexibility at the smaller scales revolve around the transport system and sizes of population units. During the course of this chapter the various factors effecting the degrees of flexibility required have been assessed and a possible system that could satisfy these demands has been postulated. The system could develop at this scale any combination of transport facilities that are likely to be required and change it with the demand as the town develops. It could at the same time incorporate any combinations of the various sizes of population units that could be demanded by current social opinion. The degree of flexibility obtainable within the organisation outlined could effectively remove the monotony and lack of character previously associated with systems of infinite growth based on series of identical units.

Effects of social organisation on city cluster scales

37. So far the requirements of infinite growth have been considered at a local scale, and an example of a system which could satisfy these has been postulated. It is now necessary to examine methods by which this system could be organised into larger scales of development; towns, cities and even sub-regions.

38. Investigation at this larger scale involves an aspect not considered so far; that is the main city or regional centre. Major facilities are generally concentrated in the main centre, but in addition it also serves as a local centre for the population immediately surrounding it. It is possible that this duality of function has, in the past, been responsible for the intensity of use, and thus congestion, at the major centre. However, this is not to infer that a major centre could consist entirely of major facilities since many of these depend upon an associated concentration of demand facilities and thus a fairly large dependent local population. Studies on the optimum size of such a population which provide both a wide range of facilities and the possibility of full private mobility are too dependent upon individual plan type to enable a generalised statement to be made with any accuracy. However, it would appear that the 200–300,000 range can provide the majority of such facilities as theatres, art gallery, football club, etc., and it may well be that a high degree of private mobility would still be possible.

39. The hinterland to a city plays an important part in supporting its major facilities; theoretically, the larger the hinterland the better the standard of facilities. The congestion which could be caused in individual cities by regional use could be alleviated by having several major centres within a region, each specialising in the provision of certain facilities and being linked by good communications. However, since many facilities depend upon a concentration of supporting ones, there would still be a necessity for regional centres to be on a considerable scale. The answer to the provision of good major facilities and a high degree of private mobility would appear to be in the provision of an efficient communication system between regional centres and large hinterlands.

40. The intercommunication of major centres and lines of development facilitates a movement between them which could have considerable effect on the social organisations possible. Previously, the main social organisation has emphasised local loyalties, a person identifying himself and his interests with his own town, county or residential area. This system can continue in the forms shown, each centre building up its own identity and its own introverted social group, extending for some distance into a hinterland, until a watershed is reached with the next

town. However, increased specialisation and mobility is leading to the development of new social structures, which owe allegiance not to places but to activities. Thus a person may belong to a social group supporting an opera house in one centre, theatre in another and a political club in a third. This group may draw members from a wide regional area, the generating factor being a common interest within these common locations. Such a social system can support very specialised facilities and may release interests which previously have not had the correct environment for their expression.

41. It is important that this type of development should not be confused with conurbations which have developed naturally. There are many different ways in which settlements have developed to conurbations, but the common factor in all of these is that there has been no planning. Generally the result has been confused, congested and has in many cases led to a lack of identity due to the absence of clear hierarchy of activities. In addition the prevalence of old speculative property has led to the development of many slums intermingled with haphazard industrial and transport areas, the whole producing a very unpleasant environment. Inevitably, this has resulted in a social prejudice against conurbations. However, such prejudice should not be allowed to negate the considerable advantages to be gained by large population groupings, since in a planned system the disadvantages of the spontaneous conurbations can be reduced.

42. Clearly, in a system as flexible as the one postulated the main centres will also require a considerable degree of flexibility in both size and organisation. While this is feasible for a new central town, the re-planning of an existing town on this basis is likely to present greater difficulties. However, these are not insurmountable but they would require a new approach to both land use and design.

43. Land use survey would require a far greater emphasis on potential redevelopment dates. If estimates are then made of maximum areas likely to be required for a wide range of future possibilities, plans may be arranged so that at any time the most suitable areas are available for expansion. While this would be difficult to achieve completely in many areas, its consideration during early stages of re-development would result in maximum flexibility and minimum uneconomic redevelopment.

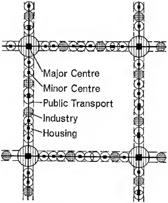
44. Expendability would be the most fundamental change required in architecture. Design for a planned life of buildings would greatly increase future growth and reorganisation possibilities, and would eventually prove more economic as buildings are continually designed according to current social and economic criteria. This principle is already used by speculative developers and industrial concerns where economic return is vital.

45. The demands of flexibility would also influence central area planning. With changing regional and city functions, the scale and organisation would have to alter; both overall and development area plans would have to take account of this, and should be considered from the start on a flexible basis as a potential part of a larger development. Maximum change of use should be allowed for, in some cases to the extent of flexible use buildings.

46. It is important that flexible re-planning of existing centres is considered from the start, and it is fundamental for any plans prepared for Bedford and Northampton.

Transport and land use aspects of city cluster scales

47. The necessity for good communications, interconnecting major centres and hinterlands will be a critical factor of regional planning whatever hierarchy of



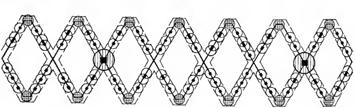


Diagram 22 Examples of large-scale organisation patterns.

centres is evolved. The demands mentioned at the beginning of the chapter for a regional flexibility of size and form have considerable effect on the transport patterns required.

48. Public transport is likely to provide the most critical requirements due to considerations of routing and services. Basically, the simpler the route pattern, the better the service provided; simple lines and loops being highly efficient. The best standards of service are provided where the number of routes needed to inter-relate all points are at a minimum.

49. Since the development is flexible, and thus can expand to any required size, the organisation adopted for the transport system must also be capable of expansion with a minimum increase in complexity. The most efficient system for both service and free expansion is the line. However, the application of this may be limited within the system outlined above since the population that any one line could support may not generate a very large centre. But these objectives could be achieved by patterns of organisation composed of several open-ended lines of communication or more complex public transport patterns.

50. A pattern built up from a series of lines appears to offer better opportunities for expansion than one built up from loops, which generally require construction in a series of finite stages. Several examples of possible organisation of lines of transport in major centres are illustrated in diagram 22.

Summery of effects at city cluster scale

51. At the city region scale the requirements of both national scales and residential scales have considerable effects on the planning organisation. Major centres play an important part in the national and regional growth pattern by their ability to provide for the higher facilities capable of generating a counter attraction to those of existing conurbations. Provision of these facilities without undue congestion is dependent upon the relationship between the major centre and its hinterland. Choice and the provision of the highest facilities can be provided by a regional interdependence of centres, while the interconnection of centres and hinterlands can enable a new social structure to develop.

52. Success of such a large-scale organisation is very much dependent upon an efficient transport system. Public transport requirements in particular will influence the regional organisation pattern, leading to a series of linear developments interconnecting major centres. Linear organisations have the additional advantage of growth flexibility when the regional pattern adopted consists of a series of open-ended lines of development.

Theoretical example

53. In order to illustrate the principle discussed in this chapter one example has been applied to the study area. It is not intended to be taken as a recommendation, and has only been considered inasmuch as it demonstrates the ideas of growth and flexibility outlined so far. This example is illustrated by diagrams 23–26.

54. In the initial stages expansions at Bedford and Northampton are of the scales and on the sites suggested in Chapter 4. Main roads connecting the two towns to the new town site at Bletchley are renewed, and in parts relocated to produce the patterns shown on diagram 23. Development of residential and industrial areas takes place along these routes; two at Northampton and one at Bedford. Each area is related to its central road in the manner discussed in paragraphs 23–26. Thus the breakdown of the area is into a series of walking distance units with a central area directly related to the public transport system using the main road. At this stage this is a bus service.

Theoretical example of inter-related dev

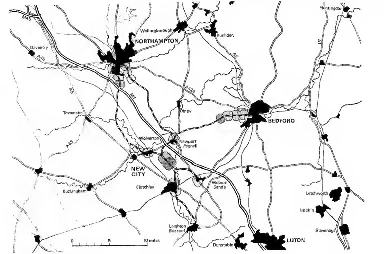


Diagram 23 Stage one.

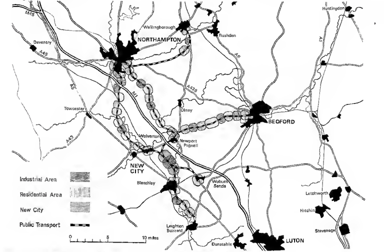


Diagram 24 Stage two.

elopment applied to the study area

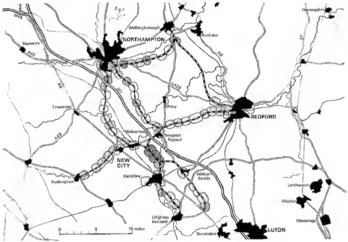


Diagram 25 Stage three.

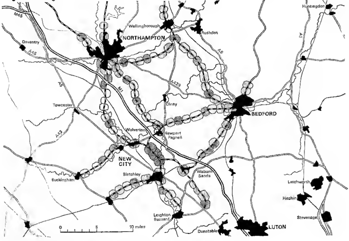


Diagram 26 Stage four.

55. Individual unit sizes depend upon the social structure desired at the time of development, site conditions, central area facilities required, etc. Study limitations have prevented detailed town analyses to determine appropriate residential unit sizes, and in the diagrams the examples are assumed to vary from 5,000 to 20,000 people.

56. The central road and public transport route connects each residential unit directly to the central area of its parent town. In both Northampton and Bedford central area redevelopment would have to be undertaken on the assumption that they may become the central towns of developments of the scale of stages 2, 3, 4 and even beyond. Planning and architectural aspects of this development should be organised so that the centres are at once entities and part of a larger potential development. This would mean consideration of the overall town redevelopments in relationship to the redevelopment potential map and the potential land use requirements of central areas and roads. Thus at any point in the future, if expansion of either of these elements becomes necessary, land ripe for development would occur in approximately the areas required for expansion. This would require individual town plans to be considered not as final designs in themselves but as one stage in a continuous process.

57. The new city has been sited in accordance with the recommendations of Chapter 4, with a population of about 200,000 by stage 1. The city could ultimately form one of four major centres in a regional plan similar to that outlined in diagrams 24–26. Therefore it has been planned to be capable of accepting both this role and its present one of a separate city.

58. The main city centre has about half this population living directly around it, representing the first stage of an ultimate population of 200–300,000 in possible later developments. The remainder are located at some distance from the main centre along the new road and public transport routes to which they are related in a similar manner to the expansion areas of Bedford and Northampton. Existing towns of Bletchley, Wolverton, Newport Pagnell and Woburn Sands are used to provide nuclei for four clusters of associated development thus reducing the adverse effects of a new centre on the surrounding towns and providing the initial incoming population with a series of existing centres. If the future allowance for expansion proved unnecessary the situation could remain at the stage of diagram 23. This would give two expanded towns, and a new city planned as a major centre with four associated developments.

59. However, the framework has been laid for any one of a number of regional organisations to develop. Several potential lines of development inter-connect the main regional centres. By the end of the first stage all of these remain open for development although in diagrams 23–26 one particular series have been followed out. Alternatively, by the end of stage 1 development could inter-connect the new city with Wellingborough, Northampton with Bedford, etc., to produce regional patterns similar to diagram 22.

60. By stage four regional development could support well over a million people. Individually, major centres could provide the facilities directly supported by several hundred thousand people, and between them they could support the specialised facilities generated by over one million. The region would thus become endowed with a wide choice and the highest facilities without the congestion normally ensuing from one major centre.

61. Public transport could develop through road bus service, separate bus service lanes, to a rail system, all using the main central transport lines inter-connecting lines of development and major centres. Alternatively, a demand for private transport could result in a further provision of roads, as outlined in paragraphs

27–30, by-passing sections of the linear developments. These would be able to both by-pass major centres and penetrate right to the central area, using the open space between development lines.

62. The example shown in diagrams 23–26 is included only to illustrate some of the points outlined in this chapter. It is by no means fully considered and does not represent working proposals for the area. These would require study in far greater depth, although it is considered that they should follow generally the guiding principles developed in this report.

Summary and recommendations

63. The scale of possible population increases plus the position of the site make it imperative that research is undertaken into regional organisation on much larger time and space scales. To provide an effective counter-attraction to existing conurbations development should be concentrated and closely associated with major national transport links. Only by these means can similar opportunities, choice and amenities be offered.

64. The uncertainty of future population increase scales, social structures and living standards makes a flexible approach to design at all scales imperative. It should be considered a major design aspect for both the Bedford and Northampton expansions and their central area redevelopments. It is essential that considerable emphasis be placed on flexibility and growth in the design of the new city. If it is not considered, serious and far-reaching damage could be done to the futures of all three towns, regional and national development possibilities.

65. In particular the uncertainty and high cost of future transport demands require a flexible approach with very close attention to land use and transport phasing. This is not the correct time to make a prediction for the future transport picture and it would be dangerous to base any town plan on one irrevocably fixed transport pattern, public or private.

66. A flexible approach to transport, social grouping and land use is possible and one has been outlined in this chapter, although there are doubtless many more. This type of approach is wholly compatible with present-day demands, and is capable of satisfying the requirements presented in Chapters 3 and 4. Thus it could be capable of both solving existing problems and laying a sound framework for future growth.

Appendix I: Statistics

Roads

1. To supplement the general observations on road conditions and density of use presented in Chapter 2, a more detailed study has been made of the major roads in the area. This is presented in a tabulated form to facilitate evaluation.

South East Regional Study—Bedford, Northampton, Bletchley

Route Evaluation

Highway	*General observations*	*Traffic density*
M1	**2. M.10 to Toddington** Junction of M1 and M10 via Beechtree ('Y') Junction south of which both motorways are dual two lane. From Beechtree to Toddington and beyond to Kilsby the M1 is dual three lane. Other junctions are: 1. Breakspears Interchange (trumpet): A414 2. Friar's Wash Interchange (semi-clover-leaf): A5 3. Pepperstock Junction (elevated roundabout) 4. Luton—Dunstable Road Interchange (depressed roundabout): A505	1960: 25,495 p.c.u's* = 100% 1961: 29,461 p.c.u's = 115% 1962: 34,030 p.c.u's = 134% 1963: 33,899 p.c.u's = 133% 1964: 34,946 p.c.u's = 137% *Flows for a 16-hour week-day in August, at a point near Newport Pagnell Service Station. 'Night flow' is approx. 16% of 16-hour flow. 'August flow' is approx. 116% of average monthly flow.
	3. Toddington to Upper Heyford Toddington Interchange is an elevated diamond carrying the A5120 across the M1 and providing links to Toddington in the south and *Bedford* in the north (via Westoning, Flitwick, and Ampthill). Toddington to Husborne Crawley is approx. 6½ miles. Husborne Crawley Interchange is an elevated diamond carrying the B557 over the M1 and providing links to *Bletchley* in the south (via Aspley Guise, Woburn Sands and Bow	

Highway	*General observations*	*Traffic density*
M1 *cont'd.*	Brickhill) and to *Bedford* in the north (via Marston Moretaine and Kempston). Husborne Crawley to Broughton is approx. 4¾ miles. Broughton Interchange is an elevated roundabout carrying the A50 over the M1 and providing links to Newport Pagnell, Wellingborough and *Bedford* in the north and indirectly to *Bletchley* (via Broughton and Woburn Sands) in the south and to the A5 at Hockliffe. Broughton to Collingtree is approx. 12 miles. Collingtree Interchange is an elevated roundabout carrying the A50B over the M1 and providing links to *Northampton* in the north and Stony Stratford and the A5 in the south (via Roade, Grafton Regis, Yardley Gobion and Old Stratford). Collingtree to Upper Heyford is approx. 6 miles. Upper Heyford is an elevated roundabout carrying the A45 over the M1 and providing links to *Northampton* in the east and Deventry in the west (thence to Coventry). **4. Upper Heyford Northwards** The M1 continues northwards to link with the M45 at Kilsby Junction, thus providing access to Birmingham and the Midlands. Construction of the London – Yorkshire motorway (M1) is in progress beyond the Crickspur and on completion will provide links to Leicester and Nottingham. Further planned extensions will provide access to Leeds, Doncaster and the north. The planned extension of the Carlisle – Birmingham motorway through the Midlands will link the M1 to the industrial belt and the north. When the flows on the M1 reach saturation level, it is unlikely that the route would be widened and more probable that an alternative route would be constructed. Although it is undesirable to increase junction frequency along the	

Highway	*General observations*	*Traffic density*
M1 *cont'd.*	motorway, it is conceivable that the junction 'forms' could be re-designed to meet the needs of any planned development.	
A5 (T)	**5. North of Weedon** Generally a single two-lane highway, but substantially widened and improved north of Crick.	
	6. Weedon to Old Stratford Generally a single three-lane highway and the proposed by-pass of Towcester should relieve this pinchpoint.	
	7. Old Stratford to Bletchley The route between Old Stratford and Stony Stratford is a single two-lane highway with an equally wide bridge over the River Ouse. The route from Stony Stratford to the outskirts of *Bletchley* is a three-lane single highway but reservation has been made for future duelling. The route is virtually frontage free, Loughton having been by-passed at an earlier date. Pinchpoints occur at the narrow bridge under the main London railway and on either side of the cross-roads at the traffic signals controlled junction of A5 and B488.	1954 : 16,200 p.c.u's 1961 : 10,700 p.c.u's 1964 : 12,800 p.c.u's * *Projected 16-hour day flows for a week-day in August.
	8. Bletchley to Friar's Wash Interchange M1 Generally a single three-lane highway with provision for duelling except for the section through Dunstable.	1954 : 19,186 p.c.u's 1959 : 25,903 p.c.u's = 100% 1960 : 11,980 p.c.u's *= 46% 1961 : 11,911 p.c.u's = 45% 1962 : 12,250 p.c.u's = 48% 1963 : 12,450 p.c.u's = 49% 1964 : 13,000 p c.u's = 51%
A43 (T)	**9. Northampton to Towcester** This is a single two-lane highway and planned improvements include a diversion at Milton Bends and a by-pass at Blissworth. No connections are available at the intersection of the A43 and the M1 some 1¾ miles north of Collingtree Roundabout.	1964 : 7,000 p.c.u's
A45 (T)	**10. Upper Heyford to Northampton** This route, providing the main link from *Northampton* to the north-west, is a single two-lane highway approx.	1964 : 7,500 p.c.u's

Highway	*General observations*	*Traffic density*
A45 (T) *cont'd.*	24 ft. wide. Horizontal and vertical alignment are fair and there are ample opportunities for improvements. The route is a 'clearway' over a considerable length. Outside *Northampton* there is only limited semi-frontage development but within *Northampton* both sides of the route have been built up. A dual two-lane highway is planned for this route.	
	11. Northampton to Wellingborough The route is presently an admixture of two-lane, three-lane and dual two-lane facilities. The planned improvements between *Northampton* and Earls Barton and the by-passes of Wilby and Wellingborough will provide a dual two-lane route.	1964 : 11,250 p.c.u's
A428 (T)	**12. Northampton to Bedford** Generally a single two-lane highway with rather poor alignment. Planned improvements include by-pass as at Little Houghton, St. Peter's level-crossing and Bromham where the long, very narrow bridge over the River Ouse is a 'listed monument'. This route could be developed to form an east – west artery but the economies of this and an alternative route on a more direct line between Northampton and St. Neot's (as suggested by the County Surveyor of Northamptonshire) require detailed consideration.	1964 : 7,000 p.c.u's
A50/508	**13. Northampton to A50/A508 Junction** This route providing the main link from *Northampton* to the south is generally a two-lane single highway but a section of dual carriageways has been constructed at Phipps Brewery. The route crosses the Wellingborough/ Bedford rail lines via a level-crossing at Cotton End. Up to this point the route has frontage development and frequent accesses on both sides, but beyond this point frontage is limited to the west side, with open parkland on the east side.	1964 : 14,000 p.c.u's
A50	**14. A50/A508 Junction to Newport Pagnell** Generally a single two-lane highway of fair alignment. No improvements have been planned.	964 : 14,000 p.c.u's

Highway	*General observations*	*Traffic density*
A50 *cont'd.*	**15. Newport Pagnell to M1 at Broughton Interchange**	
	Through Newport Pagnell this route is a narrow, all-purpose street with right-angled junctions, traffic signal controls and has frontage development on either side. Beyond Newport Pagnell the route comprises a two-lane single highway, approx. 24 ft. wide, and well aligned.	1964: 11,800 p.c.u's
	16. Broughton Interchange to A5 at Hockliffe	
	From Broughton to Woburn Sands the road is approx. 24 ft. wide, but is twisty with several severe bends and a level-crossing at the Bedford/Bletchley rail line. Between Woburn Sands and Woburn the route is a single two-lane highway approx. 22 ft. wide, but through Woburn it narrows and has frontage development on either side. Beyond Woburn it is generally 22 ft. wide and frontage-free to Hockliffe.	1962: 1,700 p.c.u's 1964: 1,920 p.c.u's
A50B	**17. A50/A50B Junction to M.1. at Collingtree Roundabout**	
	This route is presently being re-constructed to provide dual two-lane carriageways and this may be indicative of the relative values of this route and the A45 as links to the motorway, i.e. this suggests that *Northampton* looks towards London rather than Birmingham, which is contrary to opinions expressed at various sources.	
	18. Collingtree Roundabout to Old Stretford	
	This route links the M1 to the A5 at Old Stratford via Roade, Grafton Regis and Yardley Gobion and is generally a two-lane single highway approx. 22 ft. wide. From the M1 to Roade, where there is a very narrow bridge over the main London railway, the road is twisty with several severe double bends but free of frontage problems. From Roade to Grafton Regis the road alignment is similar and pinchpoints occur at a narrow bridge under the dis-used Bedford/Banbury railway; a bridge over the Grand Union Canal and two minor bridges over streams. Some	1964: 7,800 p.c.u's

Highway	*General observations*	*Traffic density*
A608 *cont'd.*	fair gradients (+ve and −ve) occur on the approach to Grafton Regis. From Grafton Regis to Yardley Gobion the route is still quite twisty with a right-angle junction at Yardley Gobion where a minor road provides a link (signposted) to the A5. From Yardley Gobion to Old Stratford the road is still twisty with one narrow bridge across a minor stream and links to the A5 at Old Stratford via a direct cross-roads. This route could readily be developed as the spine of an expansion in the area between the M1 and A5, thus providing direct communications between Bletchley and Northampton.	
A422	19. **Stony Stratford to Newport Pagnell** Generally a single two-lane highway but pinch points occur at Stony Stratford and Wolverton. Traffic directed to the M1 via this route has to cross the motorway, pass through Newport Pagnell and thence loop back to the motorway via A50 to gain access at Broughton Roundabout.	
	20. **Newport Pagnell to Bridge End** The route has largely been re-constructed as a single two-lane highway to north-east of Chicheley but beyond this it is generally narrow and twisty, especially at Stagsden.	1964 : 3,200 p.c.u's*
A509	21. **Wellingborough to Newport Pagnell** Generally a single two-lane highway providing a direct link to the M1 and the south. Projected 16-hour day flows for a week-day in August.	1964 : 3,400 p.c.u's*
B557	22. **Bletchley to M1 at Husborne Crawley Interchange** The route is a two-lane single highway generally in the order of 20 ft. wide. The section through Bow Brickhill is narrow with frontage development on both sides, but the right-angled bends (right and left) at either end of the village facilitate by-passing the built-up area.	
B557	The route from Bow Brickhill to, and through, Woburn Sands, Aspley Guise and Husborne Crawley has narrow and	

Highway	*General observations*	*Traffic density*
B557 *cont'd.*	twisty sections and a cross-roads at Woburn Sands which makes it totally inadequate as a link to the M1 and *Bedford.*	
	23. Husborne Crawley Interchange to Bedford This route has been reconstructed as a two-lane 24 ft. wide single highway from the M1 to the junction with the minor road to Lidlington. Beyond this point the route has several twisty sections but is frontage-free except for Marston Moretaine and Kempston. This route appears to form the main link from *Bedford* to the M1 in preference to the Ampthill/Toddington route.	
A418/ A5120	**24. Bedford to M1 at Toddington** Generally a single two-lane highway of moderate standards. The planned by-passes of Ampthill and Flitwick will provide considerable relief and enhance this route to the M1 and the south.	
	25. Northampton and Bedford Boroughs A detailed study of the Boroughs' traffic problems and road networks is beyond the scope of our brief and it would be premature to propound proposals which will rightfully emerge from the comprehensive survey work now in progress. However, the data available indicates that some form of peripheral by-pass routes are desirable to facilitate sub-regional movements.	

Employment

26. In Chapter 2, paragraph 29, the susceptibility of the study area to employment trends in the surrounding regions is pointed out. In succeeding paragraphs major changes in these regions are outlined and some evaluation is made of the implications. A full study has been undertaken of the employment structures in the regions shown in diagram 8, and the results are summarised by diagrams 27–30.

27. A similar but more detailed investigation for the major towns in the study area was necessary for the survey and analysis in Chapters 2 and 3. Results of this study are included to substantiate statements made there.

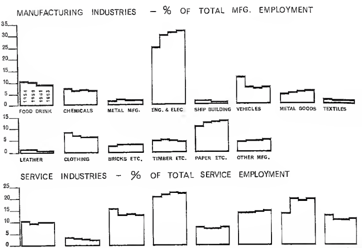


Diagram 27 London and the South East region.

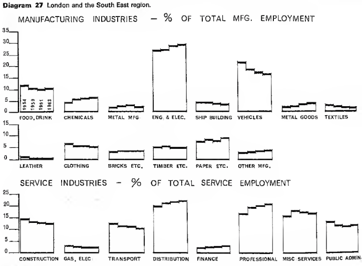


Diagram 28 Eastern and Southern regions.

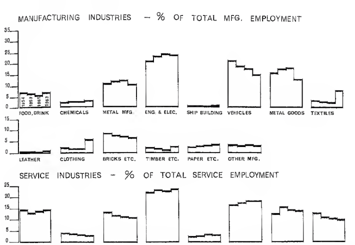


Diagram 29 Midlands region.

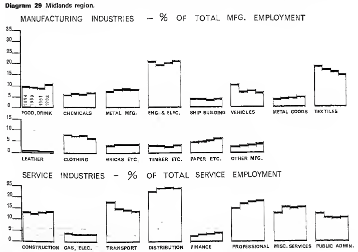


Diagram 30 Rest of Great Britain.

Employment Distribution—Northampton

Date	*Total*	*% Services XVII-XXIV*
1951	88,920	42%
1955	61,293	38.5%
1958	62,775	38.5%
1961	64,959	43%
1963	67,670	45%

Employment Distribution—Northampton

Date	*I Ag. F & F*	*II Mining*	*III Food D & T*	*IV Chemicals*	*V Metal Mfg.*	*VI Eng & Elec*	*VII Ships*	*VIII Vehicles*
1951	2,592	120	1,407	255	288	6,524	—	2,941
1955	1,588	133	1,641	278	297	7,013	—	3,741
1958	1,554	194	1,683	258	268	8,095	—	3,991
1961	1,202	127	1,699	845	290	9,163	—	2,483
1963	1,165	117	2,049	1,211	240	9,014	49	2,738

Employment Distribution—Northampton, expressed as % of total amplomant

1951	3.7%	.2%	2.0%	.4%	.4%	9.4%	—	4.3%
1955	2.6%	.2%	2.7%	.4%	.6%	11.4%	—	6.1%
1958	2.5%	.3%	2.7%	.4%	.4%	12.9%	—	6.4%
1961	1.8%	.2%	2.6%	1.0%	.4%	14.1%	—	3.8%
1963	1.7%	.2%	3.0%	1.8%	.4%	13.3%	.1%	4.0%

Employment Distribution—Northampton

Date	*IX Metal Goods*	*X Textiles*	*XI Leather*	*XII Cloth. & Foot.*	*XIII Bricks*	*XIV Timber, etc.*	*XV Paper*	*XVI Other Mfg.*
1951	125	251	1,825	15,825	154	1,035	1,930	774
1955	118	252	1,827	12,974	173	1,166	1,814	424
1958	136	152	1,457	12,419	187	1,095	1,670	647
1951	141	155	1,424	11,741	188	1,200	1,279	1,060
1953	345	175	1,352	10,807	282	1,290	1,430	1,145

Employment Distribution—Northampton, expressed as % of total

1951	.2%	.4%	2.6%	22.6%	.2%	1.5%	2.8%	1.1%
1955	.2%	.4%	3.0%	21.1%	.3%	1.9%	3.0%	.7%
1958	.2%	.2%	2.3%	20.0%	.3%	1.7%	2.7%	1.0%
1951	.2%	.2%	2.2%	18.0%	.3%	1.8%	2.0%	1.6%
1963	.5%	.3%	2.0%	15.7%	.4%	1.9%	2.1%	1.7%

Employment Distribution—Northampton

Date	*XVII Constr.*	*XVIII Gas, Elec. & W.*	*XIX Transp.*	*XX Dist. Tr.*	*XXI Ins B & F*	*XXII Prof*	*XXIII Misc. Serv.*	*XXIV P. Admin.*
1951	3,675	1,810	4,689	7,345	728	7,063	4,118	3,611
1955	4,199	1,581	3,285	7,047	848	4,927	3,419	2,525
1958	4,597	1,573	3,324	7,160	939	5,512	3,026	2,650
1961	4,188	1,532	2,910	8,568	1,227	5,410	4,721	2,576
1963	4,313	1,551	3,188	8,962	1,519	6,900	5,222	2,805

Employment Distribution—Northampton, expressed as % total

1951	5.3%	2.6%	8.7%	10.6%	1.1%	10.2%	5.0%	5.2%
1955	6.8%	2.6%	5.3%	11.4%	1.4%	8.0%	5.5%	4.1%
1958	7.3%	2.5%	5.3%	11.4%	1.5%	8.8%	5.1%	4.2%
1961	6.4%	2.3%	4.6%	13.1%	1.9%	9.9%	7.2%	4.0%
1963	6.4%	2.3%	4.7%	13.2%	2.2%	10.1%	7.7%	4.1%

Employment Distribution—Bedford

Date	*Total*	*% Services*
1951	40,213	60%
1955	40,527	42%
1958	41,981	43%
1961	46,001	47%
1963	47,818	50%

Employment Distribution—Bedford

Date	*I Ag. F & F*	*II Mining*	*III Food D & T*	*IV Chemicals*	*V Metal Mfg.*	*VI Eng. & Elec.*	*VII Ships*	*VIII Vehicles*
1951	2,094	44	1,811	137	987	6,620	8	684
1956	2,186	181	2,533	129	1,044	4,848	2,343	1,371
1958	1,882	158	2,873	102	1,107	6,143	2,328	1,864
1961	1,885	30	2,633	293	1,245	5,167	2,658	360
1983	2,024	28	2,078	287	1,296	6,536	2,157	682

Employment Distribution—Bedford, expressed as % of total

1961	5.2%	.1%	4.5%	.3%	2.4%	16.4%	—	1.5%
1955	6.4%	.4%	6.2%	.3%	2.6%	12.0%	5.8%	3.4%
1958	4.4%	.4%	6.8%	.2%	2.6%	12.2%	5.5%	4.4%
1961	4.2%	.1%	6.8%	.6%	2.8%	11.4%	6.7%	.8%
1963	4.3%	.1%	4.4%	.6%	2.7%	11.6%	4.5%	1.4%

Employment Distribution—Bedford

Date	*IX Metal Goods*	*X Textiles*	*XI Leather*	*XII Cloth & Foot*	*XIII Bricks*	*XIV Timber etc.*	*XV Paper*	*XVI Other Mfg.*
1951	133	26	483	600	3,005	382	637	295
1955	88	32	435	688	3,318	322	696	382
1958	107	29	409	738	3,034	328	872	379
1981	66	28	399	702	3,257	174	994	350
1963	67	30	396	849	3,267	172	1,121	614

Employment Distribution—Bedford, expressed as % of total

1961	.3%	.1%	1.2%	1.5%	7.6%	.9%	1.6%	.7%
1955	.2%	.1%	1.1%	1.6%	8.2%	.8%	1.7%	9%
1958	.3%	.1%	1.0%	1.7%	7.2%	8%	2.1%	.9%
1981	.1%	.1%	.9%	1.6%	7.2%	.4%	2.2%	.8%
1963	.1%	.1%	8%	1.4%	7.2%	.4%	2.3%	1.1%

Employment Distribution—Bedford

Date	*XVII Constr*	*XVIII Gas & Elec.*	*XIX Transp.*	*XX Dist. Tr.*	*XXI Ins. B & F*	*XXII Prof*	*XXIII Misc. Serv.*	*XXIV P. Admin.*
1951	2,261	2,315	2,097	4,015	488	3,915	2,547	4,683
1955	3,010	859	1,877	4,515	826	3,295	2,132	3,604
1958	2,484	1,070	1,810	4,727	766	3,373	2,788	3,629
1961	3,583	1,182	1,625	5,339	790	6,438	2,983	2,847
1963	3,234	1,245	1,685	6,160	943	7,492	3,327	3,022

Employment Distribution—Bedford, expressed as % of total

1951	6.7%	5.7%	6.9%	10.0%	1.2%	9.7%	6.3%	11.6%
1955	7.4%	2.1%	4.9%	11.1%	1.6%	8.1%	5.3%	9.0%
1958	6.0%	2.6%	4.3%	11.2%	1.8%	8.0%	6.5%	8.6%
1961	8.0%	2.6%	3.6%	11.8%	1.8%	14.3%	8.7%	8.3%
1963	6.3%	2.8%	3.5%	13.0%	2.0%	15.6%	7.0%	6.4%

Employment Distribution—Bletchley

Date	*Total*	*% Services*
1951	8,156	40%
1955	10,417	40%
1958	10,726	40%
1961	11,198	39%
1963	12,851	41%

Employment Distribution—Bletchley

Date	*I Ag. F & F*	*II Mining*	*III Food D & T*	*IV Chemicals*	*V Metal Mfg.*	*VI Eng & Elec*	*VII Ships*	*VIII Vehicles*
1951	634	—	125	24	—	653	—	119
1953	539	—	154	96	4	825	—	273
1958	396	—	232	110	114	856	—	273
1961	306	—	185	157	153	670	—	147
1963	410	—	288	213	180	978	—	144

Employment Distribution—Bletchley, expressed as % of total

1951	7.8%	—	1.5%	.3%	—	6.7%	—	1.5%
1953	6.2%	—	1.5%	.9%	—	8.0%	—	2.6%
1958	3.7%	—	2.2%	1.0%	1.1%	8.0%	—	2.5%
1961	2.7%	—	1.7%	1.5%	1.5%	6.0%	—	1.3%
1963	3.2%	—	2.2%	1.9%	1.6%	7.6%	—	1.1%

Employment Distribution—Bletchley

Date	*IX Metal goods*	*X Textiles*	*XI Leather*	*XII Cloth. & Foot.*	*XIII Bricks*	*XIV Timber, etc.*	*XV Paper*	*XVI Other Mfg.*
1951	—	—	—	279	2,592	86	121	403
1953	4	14	18	398	3,334	111	159	379
1958	161	20	20	439	3,068	124	246	362
1961	43	27	20	382	3,381	384	443	480
1963	54	18	17	196	3,296	447	670	635

Employment Distribution—Bletchley, expressed as % of total

1951	—	—	—	3.4%	32.0%	1.0%	1.6%	5.0%
1953	—	.1%	.2%	3.8%	32.0%	1.1%	1.5%	3.6%
1958	1.6%	.2%	.2%	4.1%	28.6%	1.2%	2.3%	3.4%
1961	.4%	.2%	.2%	3.4%	30.0%	3.4%	4.0%	4.3%
1963	4%	.1%	.1%	1.5%	25.7%	3.5%	5.2%	5.0%

Employment Distribution—Bletchley

Date	*XVII Constr.*	*XVIII Gas & Elec.*	*XIX Transp.*	*XX Dist. Tr.*	*XXI Ins. B & F*	*XXII Prof.*	*XXIII Misc. Serv.*	*XXIV P. Admin.*
1951	538	12	1,086	669	76	104	509	226
1953	702	139	1,035	722	140	427	617	327
1958	641	124	1,048	894	91	610	496	401
1961	624	134	953	949	90	813	633	324
1963	984	170	992	1,092	148	999	695	325

Employment Distribution—Bletchley, expressed as % of total

1951	6.6%	.1%	13.4%	8.2%	.9%	1.3%	6.2%	2.8%
1953	6.7%	1.3%	10.0%	6.9%	1.3%	4.0%	5.9%	3.1%
1958	6.0%	1.2%	9.8%	8.4%	.8%	5.7%	4.6%	3.7%
1961	5.6%	1.2%	8.5%	8.5%	.8%	7.2%	4.8%	2.9%
1963	7.7%	1.3%	7.7%	8.5%	1.2%	7.8%	4.7%	2.5%

Employment Distribution—Whole region

Date	*Total*	*% Services*
1951	158,771	39%
1955	167,515	35%
1958	171,546	36%
1961	178 881	40%
1963	185 750	42%

Employment Distribution—Whole region

Date	*I Ag F & F*	*II Mining*	*III Food D & T*	*IV Chemicals*	*V Metal Mfg.*	*VI Eng. & Elec.*	*VII Ships*	*VIII Vehicles*
1951	8,333	805	4,734	829	2,290	15,224	8	9,252
1955	8,882	990	5,805	855	2,799	16,082	2,343	11,254
1958	6,229	1,090	6,515	886	2,658	15,809	2,328	11,873
1961	5,704	923	8,137	1,555	2,856	18,555	2,560	7,477
1963	5,084	857	5,705	2,363	2,688	19,356	2,214	7,465

Employment Distribution—Whole region, expressed as % of total

1951	4.9%	.5%	2.8%	.6%	1.4%	9.0%	—	6.5%
1955	4.1%	.6%	3.5%	.5%	1.7%	9.0%	1.4%	6.7%
1958	3.6%	.8%	3.8%	.5%	1.5%	9.8%	1.4%	8.8%
1981	3.2%	.5%	3.4%	.9%	1.8%	10.3%	1.4%	4.2%
1963	3.2%	.5%	3.5%	1.3%	1.4%	10.3%	1.2%	4.0%

Employment Distribution—Whole region

Date	*IX Metal Goods*	*X Textiles*	*XI Leather*	*XII Cloth. & Foot.*	*XIII Bricks*	*XIV Timber, etc.*	*XV Paper*	*XVI Other Mfg.*
1951	401	348	4,110	32,801	8,843	1,728	4,081	2,397
1955	329	417	3,727	29,492	8,067	1,895	4,813	2,422
1958	598	274	3,446	28,679	7,212	1,873	4,627	2,770
1961	471	265	3,370	27,528	7,889	2,091	4,716	3,420
1963	754	239	3,330	25,802	7,827	2,245	6,009	3,023

Employment Distribution—Whole region, expressed as % of total

1951	.3%	2%	2.4%	19.5%	4.0%	1.0%	2.4%	1.4%
1955	.2%	.3%	2.2%	17.6%	4.8%	1.1%	2.7%	1.4%
1958	.4%	2%	2.0%	15.7%	4.2%	1.1%	2.7%	1.6%
1961	.3%	.1%	1.9%	15.4%	4.4%	1.2%	2.6%	1.9%
1953	.4%	.1%	1.8%	13.7%	4.2%	1.2%	2.7%	1.5%

Employment Distribution—Whole region

Date	*XVII Constr.*	*XVIII Gas & Elec.*	*XIX Transp.*	*XX Dist. Tr.*	*XXI Ins B & F*	*XXII Prof.*	*XXIII Misc. Serv.*	*XXIV P. Admin*
1951	9,437	4,633	11,179	15,869	1,647	13,325	9,872	9,516
1965	11,050	3,255	9,059	15,188	2,064	11,529	9,272	8,321
1958	11,960	3,295	8,921	16,749	2,215	12,855	9,313	6,524
1961	11,538	3,353	8,032	19,524	2,605	17,891	12,579	7,594
1963	12,373	3,488	8,580	21,282	3,136	20,038	13,798	8,082

Employment Distribution—Whole region, expressed as % of total

1951	6.5%	2.7%	6.8%	9.4%	1.0%	7.9%	5.8%	6.7%
1955	6.8%	2.0%	8.4%	9.5%	1.2%	6.9%	6.5%	5.0%
1958	7.0%	1.9%	5.2%	9.8%	1.3%	7.5%	5.4%	6.0%
1951	7.5%	1.9%	4.5%	10.9%	1.4%	10.8%	7.0%	4.2%
1983	8.6%	2.0%	4.6%	11.4%	1.7%	10.7%	7.4%	4.3%

Costs of developments

28. When considering the merits and demerits of expansion schemes and new town schemes in Chapter 4, the assumption was made that new towns are cheaper in cost per person accommodated than are town expansions. This assumption is not accepted by all authorities, and therefore it is necessary to outline here the reasons for using it.

29. Very little research work has been done on this subject and published reports on development costs of large-scale schemes are extremely limited. However, two major investigations have been carried out within the last five years on developments of a comparable scale to the ones considered in this study, and in sufficient detail to enable some comparisons to be made. In 1961 the L.C.C. published 'The Planning of a New Town', describing a town for 100,000 people at Hook. A costing is included in this report, in which 1960 prices have been adjusted to 1963 prices. In 1963 three expansion studies commissioned by the Ministry of Housing and Local Government from private consultants were published, dealing with Ipswich, Worcester and Peterborough.

30. Since these studies are fairly similar in scales and degrees of detail, they are considered to be the most suitable recent sources for a cost comparison, although the town expansions were designed before the Buchanan Report and may therefore under-estimate the true transport costs. It should be emphasised that these figures by no means present a fully conclusive case for the assumption that town expansions are more expensive than new towns but are simply the best evidence available.

31. Results of the four costings are shown in table 6 where the effect of different scales of increase is also indicated. The Peterborough study dealt with expansions of 50%, 100% and 150%, and these are compared diagrammatically with the Hook report in diagram 31, in an attempt to illustrate the areas of additional expenditure.

32. From the diagram it can be seen that the bulk of additional cost is incurred in the redevelopment of the central area, and in the new transport system. It should be pointed out that these improved facilities will be enjoyed by the existing community of a new town, and thus the increased expenditure may be fully justified. Final answers to this question could only be arrived at by a full-scale cost/benefit study which included all benefits gained by both incoming and existing population.

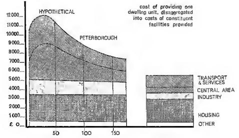


Diagram 31 Costs of development.

33. The assumption that town expansion is more expensive than new towns is disagreed with by a number of authorities using more theoretical studies made prior to the reports discussed above. The most noted of these is P. A. Stone, who, in the book 'Housing, Town Development, Land and Costs', derives estimates of £1,180/person for a new town and £1,100/person for a town expansion. He also brings the New Towns Committee estimate up to date, and arrives at a figure of £1,200/person, while Dr. Nathaniel Lichfield estimates town expansion costs at £1,000/person. This would indicate that town expansions are the cheaper solution.

34. Thus the subject of development-costing on this scale is open to widely varying conclusions. However, for the reasons quoted in paragraph 30 the assumption has been made in this study that new towns are cheaper per person accommodated than are town expansions.

	Ipswich		Worcester at 15 years		Peterborough			Hook
Expansion Scheme	80%	100%	50%	100%	50%	100%	150%	New Town Adjust-ment
Transport and Services	668	627	1,821	1,106	2,703	1,685	1,360	1,325
Central Area	1,118	840	288	281	3,730	2,133	1,400	550
Industry	561	588	1,041	988	1,558	1,460	1,430	680
Housing	2,839	2,846	3,670	3,518	2,919	2,925	2,929	2,430
Other	859	844	482	375	601	593	585	515
Total/dwelling	**6,673**	**6,397**	**7,081**	**6,281**	**11,511**	**8,796**	**7,700**	**5,500**
Total/person	**1,980**	**1,830**	**2,000**	**1,780**	**2,875**	**2,375**	**2,075**	**1,780**

Sources:
Ipswich Expansion Report.
Worcester Expansion Report, at 15 year development.
Peterborough Expansion Report, Appendix 23, summarised.
'The Planning of a New Town', Table 8, years 0–50, summarised adjusted to 1963 prices.

Table 8: **Development Costs in £'s.**

Appendix II: Example of development

Example of development aiming at a high environmental standard in which encouragement of the use of public transport can accommodate growth beyond designed limits without prejudice to that standard.

Problem

1. With new urban settlements of a size substantially beyond that of the existing New Towns more thought must be given to the integration of all forms of transport.

2. Should these cities, when built, grow or be expanded beyond the initial target populations their traffic problems, and particularly the relative importance of public transport, will markedly increase.

3. Therefore some form of development is needed which relates growing traffic to growing development in such a way that the capacity of the traffic facilities can maintain an acceptable level at all stages without over-provision. Since this must be done against the background knowledge that free movement of the motor-car becomes increasingly difficult with increasing size, the system must accommodate the possiblity of a change from private towards public transport as the city grows.

4. The city form must allow for flexibility and growth in both the transport sectors and, while allowing the maximum private facility (i.e. roads, etc.) that good traffic planning and the public purse can provide, it must also encourage a growth of public transport which is sound enough to take an increasing load as circumstances require it (diagram 32).

Concept

5. This example is an attempt to solve the problem by careful planning both in space and time of the locations and capacities of both private and public transport facilities in relation to the development they serve.

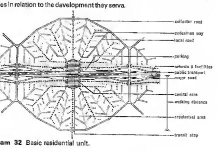


Diagram 32 Basic residential unit.

6. The essence of mass public transport is a line of movement with stopping points to which people either walk or go by taxi or car. It follows that development could be in the form of areas or 'units' based upon walking distances and containing either residential, industrial or recreational development with their related uses and being connected to each other and the city centre by the public transport line, roads and footpaths.

7. The form of this example relates this pattern to a road system and allows reservations for both forms of transport to grow in capacity allowing free choice between them, based upon acceptability and cost.

8. Residential units should be designed as areas of good environment and, among other things, pedestrian and vehicular movement should be properly integrated.

9. While the penetration of the vehicle can be controlled simply by the use of kerbs and bollards, etc., the pedestrian cannot be so controlled and, since in these areas the two must meet, nothing can prevent pedestrians straying onto the roads.

10. Pedestrian movement falls into three categories: firstly the pedestrian journey —from house to work, shops, school and the like; secondly the vehicle-orientated journey—to cars, deliveries, etc.; and thirdly random journeys, such as children at play and the walking of dogs, etc. The conflict of each of these categories with the vehicular movement in a residential area needs a special approach and, while the problems of the second and third categories are very difficult to solve, much can be done to alleviate those of the first by segregation layouts.

11. This example suggests therefore that pedestrians should be encouraged to move away from the more heavily trafficked roads by concentrating the local community facilities of a housing area to one side of it and the vehicular access to the other (diagram 33). (N.B.—Pedestrians should, of course, be physically prevented from crossing main roads except by grade-separated paths involving underpasses or bridges—see later calculations.)

12. A 'basic residential unit' is shown for purposes of calculation and incorporates a pattern based on this principle in which the community facilities, i.e. local shops, pubs, schools, churches, halls and public transport stops (which is the access to the other facilities of the city, the city centre, industry, secondary schools, recreation, etc.), are all located on one side of the housing area whose extent is related to walking distance from all of these facilities.

13. On the other side are the collector roads, dangerous for direct pedestrian crossing, from which service roads penetrate into the housing area, and also feed car parks serving jointly the community facilities and public transport stop.

14 The collector roads lead to major town roads (urban motorways) which could be located on either side or both sides of the basic unit depending on the number and arrangement of the units (see paragraph 24). These roads would be crossed as necessary by bridges or underpasses.

15. Pedestrians, although encouraged to move radially to the local centre, would be able to walk from one 'basic unit' to another, or out into the hinterland.

16. Industrial units and recreational units can be regarded in the same way as the 'Basic Residential Unit' and their sizes, location and capacities at any time can be related to the general communications pattern. Their layout will depend upon similar criteria in addition to requirements arising from the particular uses concerned.

17. The central area of such a settlement is more complex and depends upon the total population it serves and therefore no isolated study has been attempted

here. However, since certain central area activities, e.g. shopping and offices, generate co-incident trips, consideration should be given to separating such uses in their relation to communications.

Theoretical considerations

18. Basic unit: factors affecting its size

(A) *Residential sub-unit*, or the area of development served by one residential road.

Factors determining the theoretical size and population of a residential sub-unit having frontage development of roads:

- (a) Maximum acceptable volume of moving traffic in conjunction with frontage, pedestrian activity, parking, etc.;
- (b) Net density (persons per acre);
- (c) Average persons per family;
- (d) Car ownership and car usage factors.

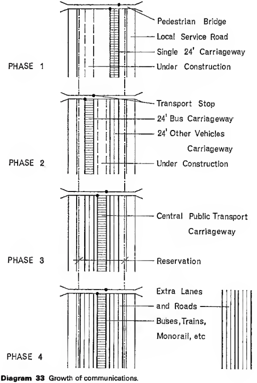


Diagram 33 Growth of communications.

(B) *Basic residential unit*

Factors determining the theoretical size and population of the basic residential unit:

(a) Walking distance to local shopping centre, schools and public transport halts;
(b) Proportion of dwellings within walking distance;
(c) Gross density (persons per acre);
(d) Capacity characteristics of peripheral roads and their junctions;
(e) Peak vehicle generation of housing sub-unit.

(C) *Basic industrial unit*

Factors determining the theoretical size and population of a basic industrial unit:

(a) Walking distance to public transport halts;
(b) Gross density (workers per acre);
(c) Capacity of peripheral roads and access points.

19. Sample calculations of size of basic unit

(A) *Residential sub-unit*

Assume:

(a) Maximum peak flow=300 v.p.h.—at this flow on a two-lane, two-way road, the presence of a parked vehicle causes 50% of the traffic to be delayed for an average period of two seconds and 30% of the gaps in the traffic stream are less than four seconds, which has been shown to be the minimum gap a pedestrian will accept to cross an 18-ft. road. (Source: 'Random theory on traffic flows and study of gaps between vehicles' —Adams);
(b) Net density=50 persons per acre;
(c) Average family consists of 3.5 persons;
(d) Average car ownership=1.2 cars per family;
(e) Work-journey car usage=50%.

N.B.—It is assumed that a 'poor' public transport system will generate a 75% car usage; a 'good' public transport system and 'free use' of the private car will generate a 50% usage and a 'good' public transport system and 'restriction on use' of the private car will generate a 25% usage.

Based on these assumptions, the size of a residential sub-unit is determined as follows:

300 v.p.h. at 50% usage = 600 cars owned
600 cars at 1.2 cars per family = 500 families
500 families at 3.5 persons per family = 1,750 population

Diagram 34 represents a graphic correlation from which the results of this calculation may be obtained for a variety of values assigned to the basic assumptions.

(B) *Basic residential unit*

Assume:

(a) Maximum walking distance = ½ mile;
(b) Proportion of dwellings within walking distance = 100%;
(c) Gross density = 30 persons per acre;
(d) Capacity of peripheral road characterised by uncontrolled surface junctions with feeder having a maximum aggregate of conflicting flows at any junction = 1,200 v.p.h.

N.B.—Beyond 1,200 v.p.h. some control would be required.

(e) Peak vehicle generation of housing sub-unit = 300 v.p.h.

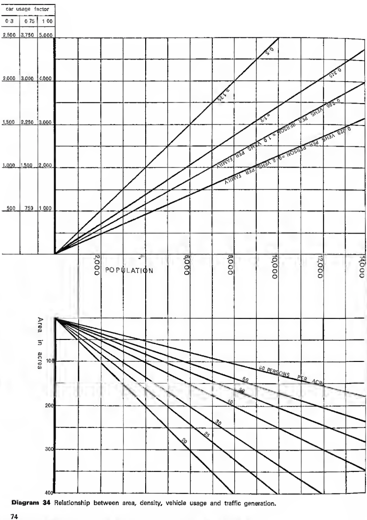


Diagram 34 Relationship between area, density, vehicle usage and traffic generation.

Based on these assumptions, the residential unit can be qualified as follows:

Base dimension of unit = 1 mile
Area of residential unit = $\frac{1}{2}\pi R^2$ where R = $\frac{1}{2}$ mile = 250 acres
250 acres at 30 persons per acre = 7,500
No. of sub-units per basic unit = $\frac{7,500}{1,750}$ = 4.3, say *5*
Length of peripheral road = 2,640 yards
No. of surface junctions = 5 + 2 for local centre
∴ Spacing of junctions = $\frac{2,640}{8}$ = 330 yards

Peak number of work journey vehicles on road = 5 x 300 = 1,500 v.p.h.
Assuming an even directional distribution of peak-hour traffic, the maximum flow of work-journey vehicles = 750 v.p.h. Thus, the minimum facility required is a three-lane highway with surface junctions where the centre lane is reserved for turning traffic. Diagram 35 is a diagrammatic representation of the alternative forms which the service roads to the sub-units might take. Diagram 36 is a diagrammatic representation of the interaction of adjacent units having different degrees of bias for the peripheral traffic.

(C) *Basic industrial unit*

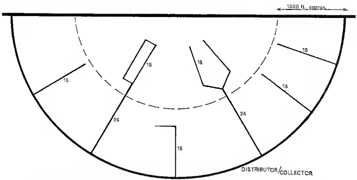
Assume:

(a) Maximum walking distance = $\frac{1}{2}$ mile;
(b) Gross density of workers per acre = 30;
(c) 1.5 workers per family, i.e. $\frac{1.2}{1.5}$ = 0.8 cars per worker;
(d) 50% car usage, i.e. 0.4 cars per worker appear in work-journey flows.

Based on these assumptions, the industrial unit can be qualified as follows:

Base dimension of unit = 1 mile
Area of industrial unit = 250 acres approximately
250 acres at 30 workers per acre = 7,500 workers
7,500 workers at 0.4 cars per worker = 3,000 cars

Assuming an even directional distribution of peak-hour traffic, the maximum work-journey exodus = 1,500 vehicles in each direction. Thus a two-lane dual



LIMITING LENGTH OF 18'—0" CUL-DE-SAC = 1000 ft. approx.
24'—0" FEEDER ROAD REQUIRED FOR DISTANCES IN EXCESS OF 1000 ft. FROM COLLECTOR/DISTRIBUTOR ROAD
PEDESTRIAN/VEHICLE CONFLICT ACCEPTABLE ON ROADS WITH VOLUMES LESS THAN 300 V.P.H.

Diagram 35 Feeder road standards.

carriageway facility is required and for surface junctions some means of control may be required during the peak traffic periods.

20. Combination of units – residential industrial ratio

Assume:

(a) Basic residential unit = 7,500 population
i.e. Basic residential unit = 2,200 families
Basic residential unit = 3,300 workers
(b) ⅛th of workers employed in central area, i.e. 400 workers;
(c) ⅛th of workers employed locally within basic unit, i.e. 400 workers;
(d) Basic industrial unit employs 7,500 workers;
(e) Balanced settlement, i.e. theoretically no commuting.

Based on these assumptions, the residential industrial ratio is determined as follows:

Workers travelling from each residential unit to industrial unit = 3,300 – 800
= 2,500
Workers employed in each industrial unit = 7,500
∴ Ratio of residential units to industrial units = 3 to 1

In arranging combinations of units it is desirable to distribute the residential and industrial units in these proportions in order to achieve maximum dispersal of traffic and hence efficient use of both road-space and public transport.

City form

21. The organisation of a city based upon these 'basic units' is, of course, in a linear form. Effects on traffic of growing lines of development and of patterns of

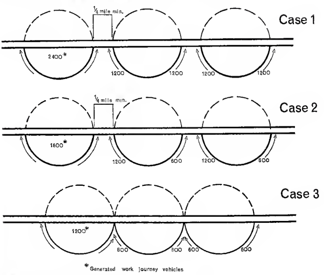


Diagram 36 Interaction of units.

lines of development have been studied. While some forms show great promise in that development can expand without growth of transport appearing to get out of hand, other forms quickly lead to situations which increase traffic volumes in a most alarming way. However, studies in this direction hava not reached a point where any definite conclusions can be reached.

Flexibility

22. Flexibility is possible in the 'basic unit' both in its initial design end its growth over a long period of time. Within a basic framawork of planning end communications principles, units are capable of independent design and thus variety can be achieved in population, density, form, nature, character and layout of development. The ratio of public to private transport can vary as the city grows since e greatar emphasis than hitherto is placed upon increasing widths of existing roads and increasing frequency of buses than for the construction of new roads.

23. Flexibility is also possible in the arrangement of 'basic units', also subject to certain disciplines. They cen be thought of as separate units or can merge into each other in varying degrees. Ten to fifteen units could form a 'Naw Town' (which could later expand); two, i.e. one double unit, could form a small town with easy connections to others or as a satellite to a larger town; a large number in various combinations could form a 'New City' (which could also grow, though probably at the eventual expense of private mobility). The units within these groupings would be capeble of development at different rates and either according to a closely-planned programme or in an *ad-hoc* manner. An infinita extension may be theoretically possible. Also the system allows the suitable siting of units on land appropriate to the uses contained within it end a merging of the naw pattern with the existing settlement pattern.

24. A fundementel feature of the basic unit is the association of the public transport end private transport systems in a communication corridor. This association induces a flexibility in economic growth, on a time scale related to the rate of general development. The stages of growth of the transport corridor are:

- (a) Single carriagewey road with mixed private cars and buses;
- (b) Single carriageway road for private transport end public transport to an adjacent separated facility;
- (c) Dual carriageway roed for private transport with the separated public transport facility now forming the central reservation;
- (d) Extra lanes to carriegeweys, or seperate by-pess roads for private transport. More efficient forms of public transport along the existing line culminating in rail, monorail, hovercraft, etc.;

The development of the public transport system from buses to eny other form (rail, hover, etc.) need only occur when the town growth and usage meke it economic to do so. Buses could even be retained on the segregated facility as the ultimate public transport service.

25. However, the following points are of vital importance:

1. (1) The public transport must provide journey times comparable with private transport and, therefore, must not be impeded by private vehicles.
2. (2) It must evolve economically as growth takes place.
3. (3) It must have superior terminal penetration to the major destinations.

26. Finally, through the designed location of the communications together with a complementary policy of developing both the public transport system and the road network only to capacities related to short-term population forecasts, it mey well be possible to cater for unforeseen marked fluctuations in the rate of building growth without at any stage allowing the area to become either grossly over- or under-provided with communications.

Appendix III: Theoretical considerations for co-ordinated linear growth

Object

1. The object of this appendix is to quantify the transportation implications of combinations of the basic land-use units determined in Appendix II.

2. It is not possible to deal with all the possible permutations of the many variables in land-use development; but an attempt is made to outline principles of land-use allocation which are consistent with minimising the transportation facilities, thus facilitating the development of an economic, optimum network.

3. In order to provide a lucid appreciation of the transportation implications of land-use allocation, several specific forms of development are considered and the resulting trip generation is outlined along with comments on the transportation facilities required for various modal splits.

Theoretical considerations

4. **Basic assumptions**

(a) Residential units are consistent in terms of form and size with the basic unit established in Appendix II.
(b) The working population and the opportunities of employment within the town are balanced.
(c) One-eighth of the working population finds employment locally in the basic unit.
(d) One-eighth of the working population finds employment in the central area.
(e) Three-quarters of the working population are distributed to the industrial areas in a specified manner. (Excluding tertiary employment, e.g. offices).
(f) The work journey is the appropriate movement for the determination of the requisite transportation facilities.

5. Initially, movements are quantified in terms of person trips on the home to work journey unrelated to a time scale and on the assumption that no commuting either 'in' or 'out' of the town occurs.

6. In order to compare the various schemes on a uniform base, the worker trips have been translated into vehicular trips on the basis of 50% car usage, i.e. on the assumption that a 'good' public transport system is provided and highway capacities facilitate 'free use' of the private car. Thus 0.4 cars per worker will appear in the work journey flows.

7. In determining the highway capacity requirements, no reduction in worker trips resulting from shift work has been considered and a spread of one hour has been adopted for the peak work journey period.

8. The number of traffic lanes indicated in the various sketches is based on lane capacity of 1,000 private cars per hour on work journey trips. This leaves a reserve

capacity to accommodate ancillary traffic flows comprising:

(a) Commercial vehicles;

(b) Private and goods vehicles on local movements other than work journey trips;

(c) Traffic making sub-regional through movements.

9. Linear type development is not conducive to more than three parallel lines of road, i.e. one central and two peripheral. Although dual carriageway facilities up to a maximum of six directional lanes is practical, four lanes are considered to be a desirable limit from the safety and environmental viewpoints, thus 12 directional lanes have been used as the limiting factor in determining whether or not the proposed 50% car usage can be achieved.

Finite development

10. Three forms of finite development comprising an arbitrary population of 360,000 are considered hereunder. Trip generation is based on each opportunity of employment in the industrial areas providing 'common attraction', irrespective of the location of the workers (with the exception of the first distribution in paragraph 12).

11. A finite town of 360,000 population, laid out on 'traditional' lines with the residential units forming spokes of a wheel around the central area and with industrial units at the end of each spoke.

Layout

Eight-spoked wheel with the radials interconnected by means of an inner and outer ring-road system.

Basic units

(a) Residential—total population = 15,000
working population = 6,000
workers employed locally = 800
workers employed in c.a. = 800
workers to be distributed to industrial areas = 5,000
(b) Industrial—opportunities for employment = 15,000
(c) Central area—opportunities for employment = 19,200

Combination of units

Three residential units and one industrial unit on each of eight routes radiating from the c.a.

Distribution of workers

Assuming 'even' distribution to all industrial areas, 625 workers 'commute' from each residential unit to each industrial unit.

Worker trip diagrams

Major worker trip desire lines are concentrated on radial routes connecting central area and industrial areas, peak flows being 15,000 worker trips.

Traffic flow diagram and highway network

The outer ring road poses no problem but the inner ring road would require a dual four-lane highway throughout. The radial routes would require four- to six-lane dual carriageways to serve the traffic demands of the private vehicles work journey alone.

Level of motorisation

This form of development is neither conducive to 'good' public transport nor economic highway use, but a 50% car usage could be achieved if special care is taken in the design of the radials at the approaches to the industrial areas.

12. A finite town of 360,000 population laid out in linear form with the central area at the centre and two industrial areas at the extremities of the line.

Layout
Linear form.

Basic units
(a) Residential as in paragraph 11.
(b) Industrial—opportunities of employment = 60,000 per unit
(c) Central area—opportunities of employment = 19,200 total

Combination of units
Twelve residential units developed between the central area and each industrial unit.

Distribution of workers
First distribution—No movements through the central area.
Second distribution—'even' distribution to each industrial area irrespective of residential location.

First distribution

Worker trip diagrams
Tidal flows to the industrial areas vary from zero to 60,000 person trips. Complementary flows of 9,600 person trips are generated by the central area—see diagram 37.

Traffic flow diagrams
The traffic flow diagrams for private transport on the work journey would be of a form similar to those shown for the worker trips, the peak flows being 24,000 per hour.

Highway network
A dual four-lane highway would adequately serve the traffic demands near the centre of the town for the work journey private cars alone, but on the approaches to the industrial areas 24 lanes would be required in either direction to accommodate private cars on the work journey.

Level of motorisation
The directional peak flows generated by this layout will create uneconomic highway and public transport demands, and a car usage of 50% is quite impractical.

Second distribution

Worker trip diagrams
The tidal flows show a spread wider than that of the first distribution, but the peak flows of 60,000 person trips are similar. The flow through the central area reaches a much higher peak of 39,600 person trips—see diagram 38.

Traffic flow diagrams
The traffic flow diagrams for private transport on the work journey would be of a similar form to those shown for the worker trips and as in the first distribution the peak flows would be 24,000 cars per hour.

Highway network
A minimum of 16 and a maximum of 24 directional lanes would be required.

Level of motorisation
Whilst the flows are still tidal in nature, the overlapping form will induce the two-

way use of public transport, which will consequently be more economic. However, a 50% car usage is still impractical.

Finite development

13. A finite town of 360,000 population, laid out in linear form but having industrial units and residential units interspersed in a 'balanced' relationship.

Layout
Linear form—see diagram 39.

Basic units
(a) Residential as in paragraph 11.
(b) Industrial—opportunities of employment = 15,000 per unit
(c) Central area—opportunities of employment = 19,200 total

Combination of units
Basic units combined to form composite sectors comprising three residential units and one industrial, thus providing a 'balance' of working population and opportunities in the sector.

Distribution of workers
Even distribution to each industrial area irrespective of residential location.

Worker trip diagrams
Compared to paragraph 12, the flow pattern is much more uniform. The peak flows of 41,200 are considerably lower and these occur near the centre of the town as against the extremities.

Traffic flow diagrams
The traffic flow diagrams for private transport on the work journey are of a similar form to those shown for the worker trips, the peak flows being 16,500 cars per hour.

Highway network
A minimum of four directional lanes are required at the extremities, but this increases towards the centre to a maximum of 16.

Level of motorisation
The layout will generate economic public transport but a 50% car usage cannot be achieved.

Infinite development

14. Trip generation is based on there being a limiting factor governing the distribution of workers to industrial areas. This fact should relate to a' time-distance' scale but, on the basis of transportation facilities having a common 'design speed', this factor can be simplified to a 'distance' scale. In the following cases a 15-mile limit has been applied to the work journey movements and, whilst variations in this limit would affect the peak value of trips generated, the graphic form would remain unchanged.

A linear town open-ended at either extremity would thus theoretically permit infinite growth and having industrial units and residential units interspersed in a 'balanced' relationship. Continuous development on this basis would create major 'centres' at 30-mile intervals.

Layout
Linear form—see diagram 40.

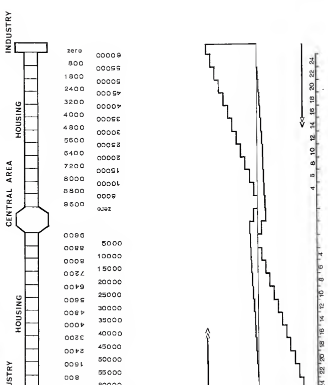
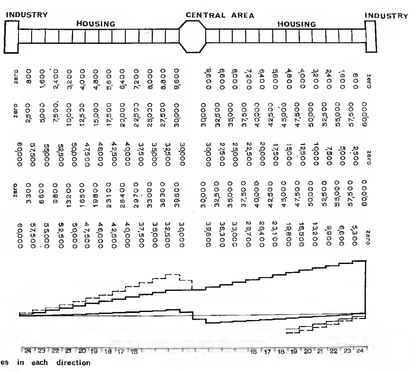


Diagram 37 Traffic generation.



WORKER TRIPS

Home to Central Area	zero	800	1,600	2,400	3,200	4,000	4,800	5,600	6,400	7,200	8,000	8,800	9,600	9,600	6,600	8,000	7,200	6,400	5600	4,800	4,000	3200	2400	1,600	600	zero
Second Distributon Home to Industry	zero	2,500	5,000	7,500,	10,000	12,500	15,000	17,500	20,000	22,500	25,000	27,500	30,000	30,000	32,500	35,000	37,500	40,000	42,500	45,000	47,500	50,000	52,500	55,000	57,500	60,000
	60,000	57,500	55,000	52,500	50,000	47,500	46000	42,500	40,000	37,500	35,000	32,500	30,000	30,000	27,500	25,000	22,500	20,000	17,500	15,000	12,500	10,000	7,500	5,000	2,500	zero
	zero	3300	6600	9800	13200	16500	19800	23100	26400	29700	33000	36300	39600	30,000	32,500	35,000	37,500	40,000	42,500	45,000	47,500	50,000	52,500	55,000	57,500	60,000
Home to Central Area and Industry	60,000	57,500	55,000	52,500	50,000	47,500	46,000	42,500	40,000	37,500	35,000	32,500	30,000	39,600	36,300	33,000	29,700	26,400	23,100	19,800	16,500	13,200	9,900	6,600	5,300	zero

Diagram 38 Traffic generation.

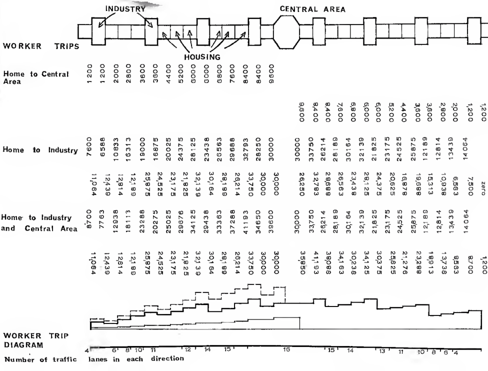
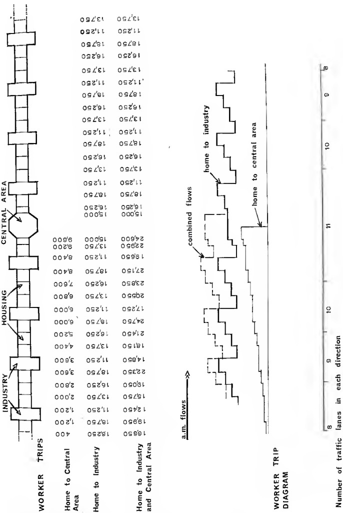


Diagram 39 Traffic generation.



WORKER TRIPS

Home to Central Area	400	1,200	1,200	2,000	2,800	3,600	3,600	4,400	5,200	6,000	6,000	6,800	7,600	8,400	8,400	9,200 9,600
Home to Industry	16,250	18,750	11,250	13,750	16,250	18,750	11,250	13,750	16,250	18,750	11,250	13,750	16,250	18,750	11,250	13,750 15,000
Home to Industry and Central Area	16,650	19,950	12,450	15,750	19,050	22,350	14,850	18,150	21,450	24,750	17,250	20,550	23,850	27,150	19,650	22,950 24,600

Home to Central Area																
Home to Industry	15,000 16,250	18,750	11,250	13,750	16,250	18,750	11,250	13,750	16,250	18,750	11,250	13,750	16,250	18,750	11,250	13,750
Home to Industry and Central Area	15,000 16,250	18,750	11,250	13,750	16,250	18,750	11,250	13,750	16,250	18,750	11,250	13,750	16,250	18,750	11,250	13,750

Diagram 40 Traffic generation.

Northampton, Bedford and North Bucks study

Correction

Page 28 – para 46

delete
"The towns involved and their population increases are:"
Together with the whole of the table commencing "Bletchley 35,000 . . . "

and insert
"The towns involved, and the possible scale of their population increases after 1964, are:

Bletchley	15,000	Buckingham	10 – 13,000
Wolverton	4 – 6,000	Newport Pagnell	7 – 10,000
Winslow	7 – 9,000	Olney	7 – 13,000

In the line commencing "This gives a total growth of . . ."
delete "90 – 106,000"
and insert "50 – 66,000"

Ministry of Housing & Local Government
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